"CONJUNCTIVAL-LIMBAL AUTOGRAFTS FOR PRIMARY AND RECURRENT PTERYGIA"

THESIS

FOR

MASTER OF SURGERY

(OPHTHALMOLOGY)

M.L.B. MEDICAL COLLEGE

BUNDELKHAND UNIVERSITY
JHANSI

2003

ASHUTOSH KHANDELWAL

DEDICATED TO
MY PARENTS

DEPARTMENT OF OPHTHALMOLOGY
M.L.B. MEDICAL COLLEGE
JHANSI

CERTIFICATE

Certified that the research work entitled "CONJUNCTIVAL-LIMBAL AUTOGRAFTS FOR PRIMARY AND RECURRENT PTERYGIA" which is being submitted as thesis for M.S.(Ophthalmology) examination of Bundelkhand University, 2003 by Dr.ASHUTOSH KHANDELWAL has been carried out in the Department of Ophthalmology, M.L.B. Medical College Jhansi.

He has put in the necessary stay in this department as per university regulations.

(Dr. B.S. JAIN)
MS
Associate Professor & Head,
Department of Ophthalmology,
M.L.B. Medical College,
Jhansi.

DEPARTMENT OF OPHTHALMOLOGY

M.L.B. MEDICAL COLLEGE

JHANSI

CERTIFICATE

Certified that the research work entitled "CONJUNCTIVAL-LIMBAL AUTOGRAFTS FOR PRIMARY AND RECURRENT PTERYGIA" was conducted by Dr. ASHUTOSH KHANDELWAL himself, under my direct supervision and guidance. The investigations, techniques and statistics mentioned in the thesis were actually undertaken by the candidate himself and observations have been checked by me regularly.

[Dr. B.S. JAIN]
MS
Associate Professor & Head,
Department of Ophthalmology,
M.L.B. Medical College,
Jhansi.

Co-guide

DEPARTMENT OF OPHTHALMOLOGY

M.L.B. MEDICAL COLLEGE

JHANSI

CERTIFICATE

Certified that the research work entitled "CONJUNCTIVAL-LIMBAL AUTOGRAFTS FOR PRIMARY AND RECURRENT PTERYGIA" was conducted by Dr. ASHUTOSH KHANDELWAL himself, under my direct supervision and guidance. The investigations, techniques and statistics mentioned in the thesis were actually undertaken by the candidate himself and observations have been checked by me regularly.

[Dr. V. K. Misuriya]
8.06.03
MS
Associate Professor,
Department of Ophthalmology,
M.L.B. Medical College,
Jhansi.

Guide

ACKNOWLEDGEMENT

It is pleasure to avail this golden opportunity to express my sincere regards and thanks to my esteemed guide Dr. V. K. Misuriya, Associate Professor , Department of Ophthalmology, M.L.B. Medical College, Jhansi for his enlightened guidance which steered me towards the harbour of success. I'm greatly thankful for his mature guidance, invaluable advice and kind supervision without which this work would not have seen the light of day.

No words can express the depth of my sense of gratitude for my revered teacher Dr. B.S. JAIN, Associate Professor & Head, Department of Ophthalmology, M.L.B. Medical College, Jhansi who epitomizes "The true teacher" to perfection .I will always try to emulate his unfazed perseverance in daunting situations, his unflagging zeal for his work and his penchant for anything novel. His unflinching support, constant encouragement and unrestrained accessibility provided the morale needed for undertaking such a project. His positive constructive criticism and fastidious approach provided the benchmarks for self-improvement. I will remain indebted to him for his valuable guidance and gracious direction.

At this juncture of gratitude, I would like to thank my respected Parents and family members who by their boundless cooperation, unconditional and firm support and encouragement, through thick and thin,

have been a constant source of inspiration and have kept me from faltering throughout this endeavour.

I would not be doing justice to my colleagues, juniors and friends especially Dr. Dheeraj Gautam & Dr.Anant Vir Jain, if I failed to mention their invaluable help, without which this work would have been a lot more difficult to complete.

Last but not the least, I thank the subjects of this study without whose cooperation this study could not be accomplished.

Ashutosh Khandelwal

Dated: 14.05.2003

Ashutosh Khandelwal

CONTENTS

INTRODUCTION

INTRODUCTION

Pterygium is an ocular surface disorder characterized by fibrovascular, wing shaped encroachment of the cornea, with a significant propensity towards recurrence after surgical excision. Ultraviolet light induced damage to the limbal stem cell barrier with subsequent conjunctivalisation of the cornea is the currently accepted aetiology of this condition.

When stem cells are damaged by disease or injury, the corneal surface becomes covered with conjunctival epithelium, which is less transparent, more irregular and more prone to erosion and vascularization than normal corneal epithelium.

The vascularity of pterygium tissue may have significance in terms of pterygium severity and progression .The fleshiness of the body of the Pterygium, denoted by obscuration of underlying episcleral vessels by the fibrovascular Pterygium tissue, is a risk factor for recurrence rate after bare sclera excision .The main histopathological change in primary pterygium is elastotic degeneration of the conjunctival collagen.

Indications for surgery include visual impairment, cosmetic disfigurement, motility restriction, recurrent inflammation, interference with contact lens wear and rarely, changes suggestive of neoplasia.

Recommended surgical management includes simple excision with or without adjunctive measures like post operative application of mitomycin-c, beta irradiation with strontium 90, topical thiotepa drops, amniotic membrane transplantation and conjunctival autografting.

Initial experience with postoperative mitomycin-c indicated severe sight threatening complications like scleral thinning, corneal edema, secondary glaucoma, corneal perforation, iritis and cataract formation etc.

Although more recent studies have reported encouraging results and fewer side effects using low dose mitomycin-C, the optimal concentration and duration of application are still being refined. The main difference between bare sclera resection and conjunctival autograft placement is that a free conjunctival graft, usually taken from the superior bulbar conjunctiva, is sutured over the denuded sclera following the pterygium resection. The reported success rates of these techniques vary widely. Simple bare sclera excision has a recurrence range from 24% to 89% while conjunctival autografting has a reported recurrence rate of 2 % to 35%.

When surgical techniques proposed for primary pterygium have been applied in recurrent cases, the possibility of secondary recurrence has been shown to increase. Thus, new therapeutic strategies should be searched for, because of the complications of surgical procedures and the high recurrence rate after treatment of this disease.

Recently, as a result of studies on stem cells that lie at the basal layer of the limbic epithelium, conjunctival autografts with limbic epithelium have been suggested in the management of the pterygium.

In this study, the effectiveness of limbal conjunctival autograft transplantation technique to prevent secondary recurrence in the management of cases with primary and recurrent pterygia has been studied prospectively.

*****

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Although there are numerous medical and surgical approaches for treating pterygium, there are also several attendant complications. Of greatest concern is recurrence of pterygium, which is often accompanied by increased conjunctival inflammation and accelerated corneal involvement. Repeated surgical procedures often only worsen the situation, as loss of conjunctival tissue and scarring can result in obliteration of fornices and mechanical restriction of extra-ocular movement.

Historically, from the earliest times medical treatment has been found unsatisfactory and attempts at local medication such as by the application of solid sodium chloride (Beard & Dimitry ,1945) the topical use of steroids (Vadala, 1953)or the sub conjunctival injection of hyaluronidase (Anastasi,1953),a method which according to Hilgers(1960) stimulates rather than inhibits growth, have proved of little value. Surgical treatment is at present the only satisfactory approach ,supplemented in case of recurrences by radiational treatment as by X-rays (Hilgartner et al 1948 ; Gibson 1951) or beta- irradiation (King 1950 ; Mead and Robertson,1957) or by the instillation of antimitotics (triethylene thiophosphoramide, Meacham 1962 ; Mori 1962).

In general, the indications for operation are continued progress of the growth so that there is a danger of involvement of the central area of the cornea, interference with ocular mobility and the development of diplopia, but some authorities consider that every pterygium is potentially progressive and should be removed as soon as possible. Some authorities advise that radiation should be given immediately or shortly after surgical removal as a prophylactic against recurrences, particularly if there is much deep

vascularisation (Maed and Robertson, 1957; Elliott, 1962; Haik,1962), while others consider that it should be postponed until recurrences develop(King, 1950) a lamellar corneal graft applied to the denuded area of the cornea after excision of the pterygium, as first suggested by Magitot(1916), is an effective method of avoiding recurrences & may improve the cosmetic results(Cameron,1964).

No surgical technique is universally accepted as being perfect, as is shown by a recurrence rate often as high as 30-80% in countries with high solar radiation (Kamel, 1946; D'Ombrain, 1948). A multitude of different operative techniques have been advocated which were reviewed by King (1950), Del Reo Cabanas (1952), Walter (1961) & others. The most important are:

Excision with simple closure of the wound including an area of clear cornea in advance of the pterygium & covering the defect in the sclera by suturing the conjunctival margins. (Von Arlt, 1850-74).

The bare- sclera method in which after excision of pterygium the small area of sclera in relation to the affected area of the cornea is not covered by conjunctiva but thoroughly denuded of subconjunctival tissue & allowed to heal by granulation (Boeckmann, 1897; D'ombrain, 1948; Mcgavic1949)

Excision & plastic repair either with a movable conjunctival flap (Campodonico,1922; Bangerter,1943),.A graft of free conjunctiva (Elschnig,1926; Spaeth,1926), mucus membrane from the lip (Duverger, 1926), amniotic membrane(Panzardi,1947) or the skin as a thiersch grafts (Hotz,1909; Wiener 1928)

Transplantations operations wherein the head of the pterygium is dissected from the cornea & transplanted under the conjunctiva away from the

limbus so that any future growth will be innocuous; this may be effected beneath the lower bulbar conjunctiva (Desmarres, 1851;McReynolds,1902), beneath the upper (Neher 1939) by splitting the pterygium horizontally & burying one half above & the other below (Knapp,1868), or by folding the pterygium back on itself (Rosen, 1948).

At the present, there are four major approaches to the treatment of this disease, specifically - surgical procedures, beta-irradiation, laser, and drugs including antineoplastic & anti-metabolite drugs. The use of adjunctive therapies like anti-mitotics & irradiation has been shown to be associated with severe sight threatening complications like scleral thinning, scleral necrosis, punctuate epitheliopathy, pyogenic granulomas cataracts, glaucoma, corneal perforation etc.

A.L. Anduze and J.M. Burnett, conducted a study to examine the complications and results of a novel approach to the use of mitomycin-C in pterygium surgery; to identify the lowest effective dosage required to prevent recurrence; and to select those high-risk pterygia that could benefit from mitomycin-C use. One hundred thirty-five eyes of 128 patients were treated with a single, intraoperative, subconjunctival injection of mitomycin-C at the site of excision. Three different dosages—0.2, 0.1, and 0.05 ml—at a strength of 0.5 mg/ml were used. There were only two recurrences (1.5%); both occurred in eyes that had undergone previous pterygium surgery. One recurrence happened with the 0.2-ml dosage, and the other with the 0.1-ml dosage. These recurrences occurred in association with early wound dehiscence. Complications included temporary and prolonged discomfort, tearing, hyperemia, subconjunctival hemorrhage, wound dehiscence, and pigment accumulation. In conclusion the persistence and intensity of

discomfort noted at the higher dosage prompted these authors to suggest that only high-risk pterygia should receive mitomycin-C.

Sanchez-Thorin JC, Rocha G, Yelin JB(1998) conducted a Meta-analysis on the recurrence rates after bare sclera resection with and without mitomycin C use and conjunctival autograft placement in surgery for primary pterygium Five eligible studies were retrieved, three comparing bare sclera resection with and without mitomycin C use, one comparing bare sclera resection with conjunctival autograft placement, and one comparing both. The pooled odds ratio for pterygium recurrence in patients who had only bare sclera resection was 6.1 (95% confidence intervals, 1.8 to 18.8) compared with the patients who had conjunctival autograft placement and 25.4 (9.0 to 66.7) compared with the patients who received mitomycin C. In conclusion the odds for pterygium recurrence following surgical treatment of primary pterygium are close to six and 25 times higher if no conjunctival autograft placement is performed or if no intra/postoperative mitomycin C is used, respectively. Surgeons and clinical trialists should not be encouraged in the use of bare sclera resection as a surgical technique for primary pterygium.

Ajayi B, Bekibele CO(1999) conducted a retrospective study to evaluate the effectiveness of post-operative beta-irradiation in the management of pterygium. A total of 124 eyes of 95 patients were operated using bare sclera method followed by application of 2500-3500 rads of Sr 90 beta-radiation. Recurrence occurred in 8 eyes (6.9%).The complications consisted of scleral necrosis, conjunctival inflammation, corneal opacities, grittiness, and cataracts.

K.R.Kenyon, M.D.Wagoner & M.E.Hettinger in 1985 first described the technique of conjunctival autografting, comprehensively. The technique and results of conjunctival autograft transplantation for advanced and recurrent

pterygium were presented for 57 eyes of 54 patients. The pterygia were primary in 16 eyes & recurrent in 41; among the latter group, 14 patients had diplopia resulting from cicatricial involvement of the medial rectus muscle. In all cases, free conjunctival grafts from the supero-temporal bulbar conjunctiva of the same eye were used to resurface exposed sclera & extra-ocular muscle. There were no intra-operative complications. Mean post-operative follow-up was for 24 months (ranged from 1 to 67 months). Only 3 pterygia recurred (5.3%); 2 were successfully remedied by a second conjunctival autograft, whereas the third did not require any additional procedure. In all 14 patients with diplopia, extra ocular movement was restored. They recommended this surgical approach as a safe & effective means of treating pterygia complicated by conjunctival scarring with extra ocular muscle involvement & requiring concurrent fornix reconstruction.

BDS Allan, P Short, G J Crawford et al (1993) conducted a cross sectional review of 93 eyes of 85 patients by slit-lamp examination, a minimum of 6 months after pterygium excision and free conjunctival autografting of six recurrences (6.5%) four were asymptomatic with minor recurrences. Complications (wound dehiscence, three cases; Tenon's granuloma, one case; conjunctival cyst, one case) were all corrected by minor surgical revision without sequelae. Unaided aquities were unchanged or improved 3 months after surgery in 86 cases. They concluded that this study demonstrates a low recurrence rate for a safe technique in an area in which ongoing ultraviolet light exposure levels are high and pterygia are prevalent.

M Guler, G Sobaci, F M Mutlu, E Yildrium et al (1994) conducted a prospective study to evaluate limbal conjunctival autotransplantation in the management of cases with recurrent pterygium .Thirty one patients were

treated by limbal conjunctival transplantation. During the mean follow up period of 10 months, 4 recurrences (13.3%) occurred and they concluded that this was a successful method to prevent secondary recurrence in the management of recurrent pterygium in patients under 40 years of age.

P P Chen, R G Ariyasu,V Kaza et al(1995) conducted a prospective study to determine the rate of recurrence and complications after bare sclera excision of primary pterygium followed by low- dose mitomycin-c(0.2 mg/ml twice daily for five days),placebo (balanced saline solution),or conjunctival autografting. Twenty four patients received mitomycin-c, twenty three conjunctival autograft, and 17 placebos. The recurrence after mitomycin-c and conjunctival autograft was 38% &39% of eyes respectively, after mean followup of 12.3 & 13.5 months .the recurrence rate after placebo was significantly higher(88%)after mean followup of 9.3 months. Increasing age was associated with significantly fewer recurrences after controlling for pterygium type (atrophic, noninflammed or inflamed). They concluded that conjunctival autograft and low dose mitomycin-c are equally effective as adjunctive treatment after excision of primary pterygia. Both methods have significantly lower rates of recurrence than bare sclera excision alone, and neither is associated with severe complications after one year of follow up. Complications, although, were seen more commonly with mitomycin-c (33%) than with conjunctival autografting (13%).

Shiro Amano, Yuta Motoyama, Tetsuro Oshika et al (2000) conducted a comparative study of intraoperative mitomycin C and irradiation in pterygium surgery To compare the rate of recurrence and complication after surgery for primary pterygium performed by one surgeon using either intraoperative mitomycin C or irradiation. retrospective study was performed of 164 eyes in 164 patients who had undergone primary pterygium surgery.

After the pterygium was excised, the bare sclera was covered by sliding adjacent superior conjunctiva. 103 eyes received intraoperative mitomycin C (0.04%, 150 seconds) and 61 eyes irradiation (total dose 21.6 Gy). The mean follow up period was 20.2 months (range 1-66 months). The recurrence rate after mitomycin C and irradiation was 8.74% and 23.0% of eyes, respectively, after mean follow up of 17.9 and 31.2 months, respectively. The Kaplan-Meier survival analysis revealed a significantly better outcome for those who had intraoperative mitomycin C. The mean interval to recurrence was not significantly different between the two groups. They concluded that the intraoperative administration of 0.04% mitomycin C is more effective than irradiation as an adjunctive treatment for pterygium surgery in the patient population examined in this study.

Vergara-SintaMario; Montoya-Gonzalez; MarthaCecilia et al (2000) conducted a study to determine the efficacy of the surgical procedure called limbal conjunctival autograft transplantation (LCAT) for the treatment of pterygium, on typical patients from Mexico. This retrospective noncomparative study was reviewed in patients with pterygium who underwent the procedure LCAT. Surgeries were performed from October 1999 to December 2000. Sex, age, relation with ultraviolet light, line of vision acuity, extent of corneal invasion, recurrence rate and complications were analyzed.67 patients were included (60,8% being female). 42% were related to sun exposure. The mean follow-up time was 11 months (range, 4-18 months). There were 68 primary and 1 recurrent pterygium. There were four recurrences (5, 7% recurrence rate), 3 occurring at 6 months and the 2 other occurring at 3 months after surgery. Among complications there was one case of graft necrosis and one case of granuloma, the later resolving spontaneously.

Donald T. H. Tan, Soon-Phaik Chee, Keith B. G. Dear, Arthur S. M. Lim (1997) conducted a study to compare success rates of conjunctival autografting and bare sclera excision for primary and recurrent pterygium in the tropics and to evaluate risk factors for pterygium recurrence. A prospective, controlled clinical trial was performed in which 123 primary and 34 recurrent pterygia, matched for age and pterygium morphology, were randomized in 2 separate studies to receive either bare sclera excision or conjunctival autograft and were reviewed at 1, 3, 6, and 12 months after surgery. Pterygium morphology was clinically graded as atrophic, intermediate, or fleshy according to an assessment of pterygium translucency. In the group with primary pterygium (mean follow-up, 15.1 months), 38 (61%) of the 62 cases of bare sclera excision had pterygium recurrence in contrast with 1 (2%) of the 61 cases of conjunctival autograft. Nontranslucency or fleshiness of the pterygium, and not age was a significant risk factor for recurrence in the e conjunctival bare sclera group. In the group with recurrent pterygium (mean follow-up, 13.2 months), 14 (82%) of the 17 bare sclera group had pterygium recurrence, while no recurrences occurred among 17 cases in the conjunctival autograft group. Nontranslucency was again a highly significant factor for recurrence .They concluded that pterygium recurrence is related to pterygium morphology and fleshiness of the pterygium is a significant risk factor for recurrence if bare sclera excision is performed. Conjunctival autografting for primary and recurrent pterygium is effective in reducing pterygium recurrence compared with bare sclera excision

Mutlu FM, Sobaci G, Tatar T, Yildirim E. (1999) conducted a study to evaluate the recurrence after treatment of pterygia using one of two techniques-limbal conjunctival autograft transplantation versus low-dose intraoperative mitomycin C (0.2 mg/ml) combined with conjunctival flap

closure. Eighty-one patients with recurrent pterygia treated by limbal conjunctival autograft transplantation (n= 41) or mitomycin C combined with conjunctival flap (n= 40) participated. Limbal conjunctival autograft transplantation or low-dose intraoperative mitomycin C application with conjunctival flap technique was performed on recurrent pterygium cases. During mean follow-up periods of 16+/-1.9 and 15.5+/-1.5 months, six recurrences (14.6%) in the limbal conjunctival autograft transplantation group and five recurrences (12.5%) in the mitomycin C group were observed .The difference between the mean ages of recurrent (26.4+/-8.0 years) and nonrecurrent (35.8+/-11.9 years) cases for all patients was statistically significant (P=0.014). Technically, limbal conjunctival autograft transplantation seemed to be more difficult. The most frequent complication in limbal conjunctival autograft transplantation was graft edema, whereas that in the mitomycin C group was superficial keratitis. They concluded that both techniques showed similar recurrence rates in the treatment of recurrent pterygia. Although technically easier to perform, further follow-up is necessary to determine the long-term safety of low-dose intraoperative mitomycin C with conjunctival flap closure.

A. P. Moriarty, G. J. Crawford, I. L. McAllister and I. J. Constable (1993) conducted a study to assess the precipitating factors, clinical course, and treatment of 11 cases of severe intraocular infections of radionecrosis after pterygium excision in an attempt to minimize the devastating ocular sequelae. From the database of cases of radionecrosis at Royal Perth Hospital and Lions Eye Institute, Perth, Australia, they identified 11 cases of severe intraocular infection complicating radionecrosis & reviewed the case notes and the available radiotherapy records (n = 8). Mean (+/- SD) dose of radiotherapy

was 22.7 +/- 1.0 Gy and mean latency period, 14.45 +/- 2.5 years. Among the six proven bacterial cases, Pseudomonas was identified in four, Staphylococcus aureus in one, and Streptococcus pneumoniae was involved in one bilateral case. Among the four fungal cases, Petriellidium boydii was indicated in two, and Fusarium and Scedosporium inflatum in one each. The condition may remain undiagnosed for some time and mimic a posterior scleritis, serous retinal detachment, or pseudotumor. Interventions included early debridement and culture; close microbiological assistance; and systemic antimicrobials for a prolonged period. Perforation or incipient perforation necessitated penetrating keratoplasties in seven patients and repeated keratoplasties in three. They concluded that the use of radiotherapy following pterygium excision should be limited and only low doses used. Ulcer beds and calcific plaques at sites of radionecrosis should not be directly covered without first performing adequate sterilization. Removal of plaques may precipitate sepsis; ulcer beds and plaques harbor infective agents. Severe radionecrosis may expose a patient to a lifelong risk of intraocular sepsis and profound visual morbidity. Conjunctival autografting is a safer method to reduce recurrence rate after pterygium excision.

Jun Shimazaki, Hao-Yung Yang, Kazuo Tsubota (1996) conducted a study to examine the usefulness of limbal autograft transplantation in the treatment of recurrent and advanced pterygia. Eleven patients with recurrent and 16 with advanced pterygia (a total of 27 pterygia) were treated with limbal autograft transplantation. Once a pterygium had been excised, superior limbal tissue was taken with conjunctival flap and transferred to the excised area. All the grafts were planted promptly, and donor sites were re-epithelialized with no excessive scar tissue formation. Although slight

recurrence was noted in 2 eyes (7.4%), subconjunctival tissue invasions were limited to less than 1 mm, and no further surgical interventions were needed. They concluded that these results indicate that limbal autograft transplantation may be effective for the treatment of recurrent and advanced pterygia.

Dekaris I, Gabric N, Karaman Z, Mravicic I, Kastelan S, Spoljaric N (2001) conducted a study to examine the usefulness of limbal autograft transplantation (LCAT) in the treatment of recurrent pterygium. Eleven eyes with advanced recurrent pterygium underwent LCAT. All eyes were previously treated at least two times either by simple excision (10) or conjunctival rotation autograft (1). In two eyes (18.18%) symblepharon was present at the time of surgery; therefore LCAT was combined with amniotic membrane transplantation. Limbal-conjunctival autograft was taken from supero-lateral part of the same eye and transferred to the area where pterygium was excised. No intraoperative complications occurred. In ten eyes (90.9%) no pterygium recurrence was recorded during the follow-up time, and one (9.1%) recurrence was recorded after 5 months. In two eyes with combined symblepharon formation remission of both pterygium and symblepharon growth was obtained. LCAT proved to be a promising and safe procedure in recurrent pterygium treatment.

Jap A, Chan C, Lim L, Tan DT (1996) conducted a study to determine the safety and efficacy of conjunctival rotation autografting (CRA) as an alternative to conventional conjunctival autograft after pterygium excision. Consecutive patients seen at the Pterygium Clinic of the Singapore National Eye Centre who were thought to be unsuitable for conventional conjunctival autografting underwent a modified surgical procedure, described as CRA. There were 51 rotation autografts performed on 45 eyes of 43 patients. In this procedure, the underlying fibrovascular pterygium tissue was

removed and the original epithelium (with minimal subepithelial tissue included) replaced over the bare sclera with a 180 degrees rotation from April 1995 to May 1996. Pterygium recurrence and complications of CRA were measured. The mean follow-up time was 12 months (range, 2-22 months). There were 46 primary and 5 recurrent pterygia. The indications for CRA were combined cataract and pterygium surgery (39.2%), double pterygia (31.4%), the need to preserve the superior conjunctiva (21.6%), and superior conjunctival scarring (7.8%). There were two recurrences (4% recurrence rate), one occurring at 4 months and the other occurring at 7 months after surgery. No significant complications were encountered. However, 50% of the grafts remained mildly injected for more than 3 months, and some remained injected for up to 13 months after surgery (average of 4 months).They concluded that Conjunctival rotation autografting is a useful technique of conjunctival grafting in cases in which it is not possible or desirable to use the superior conjunctiva as a donor source.

Dekaris I, Gabric N, Karaman Z, Mravicic I, Kastelan S (2002) conducted a study to assess the usefulness of limbal-conjunctival autograft transplantation (LCAT) for the treatment of recurrent pterygium. Seventeen eyes with advanced recurrent pterygium underwent LCAT All had already been treated at least twice either by simple excision (n=15) or by conjunctival rotation autograft (n=2). Three eyes (17.65%) had symblepharon at the time of surgery, so LCAT was combined with amniotic membrane transplantation. The autograft was taken from the supero-lateral part of the same eye and transferred to the area where the pterygium had been excised. During 6-18 months of follow-up no postoperative complications occurred. In 15 eyes (88.24%) no pterygium recurrence was recorded; recurrence occurred in two eyes (11.76%) after 8 and 5 months. In three eyes with a combined

symblepharon formation, remission of both pterygium and symblepharon growth was obtained. They concluded that LCAT seems to be a promising and safe procedure for recurrent pterygium.

Gris O, Guell JL, del Campo Z (2000) examined the usefulness of limbal-conjunctival autograft transplantation for the treatment of advanced recurrent pterygium. They selected seven patients with advanced recurrent pterygium. All had previously been treated a minimum of two times by simple excision (two of them with intraoperative mitomycin C). Limbal-conjunctival autograft transplantation after pterygium excision was performed in all cases, with a minimal follow-up period of 14 months. There were no recurrences of pterygial growth beyond the limbal edge. In addition, no significant complications were noted. Only one case of limited pseudopterygium in the donor site and one case of graft retraction were recorded. No further surgical interventions were needed in any case. They concluded that Limbal-conjunctival autograft transplantation is a promising technique for the treatment of advanced recurrent pterygium

Starc S, Knorr M, Steuhl KP, Rohrbach JM, Thiel HJ(1996) conducted a study for evaluation of the efficiency of limbal autograft transplantation for primary and recurrent pterygia. The results of limbal autograft transplantation for advanced and recurrent pterygia are presented for 58 eyes of 50 patients. The pterygia were primary in 40 eyes and recurrent in 18 eyes. Free grafts from the superotemporal limbus of the same eye were used to cover the exposed sclera. Postoperative followup ranged from 2 to 26 months, with a mean of 13 months. The overall recurrence rate was 31% (22.5% in primary pterygia and 50% in recurrent pterygia). Recurrence rates were significantly higher in patients from southern Europe than in patients from northern Europe. Analysis of patients with recurrences (n = 18) revealed

severe tear film abnormalities in eight cases. Seven patients were found to have transplants of insufficient size. Additionally, 15 patients who developed recurrent pterygium had returned to unfavourable working conditions (e.g. dust, heat). Three of the 18 recurrences underwent repeated limbal transplantation and in one of these there was a further recurrence.

Koch JM, Mellin KB, Waubke TN (1992) conducted a study based on a new concept of the limbus as a junctional zone for separating the vascularized conjunctiva from the avascular cornea, and presented conjunctival/limbal autograft transplantation for 22 cases of pterygium. The pterygia were primary in 17 eyes, cicatricial in 1 and recurrent in 4. In all cases a free transplant of the superotemperal limbus with an adjacent piece of thin conjunctiva was placed in the excision area. Postoperative follow-up ranged from 1 1/2 to 17 months, with a mean of 8.7 months. Only two pterygia recurred. In all other cases ideal anatomic reconstruction was achieved without any side effects. The authors believe that conjunctival limbal transplantation is an encouraging technique for treating a pterygium surgically.

Prabhasawat P, Barton K, Burkett G, Tseng SC (1997) conducted a study to determine whether amniotic membrane can be used as an alternative to conjunctival autograft after pterygium excision. A prospective study of amniotic membrane grafts (group A) and primary closure (group B) was compared retrospectively with conjunctival autografts (group C) in patients with pterygia. Group A included 46 eyes with primary pterygia and 8 eyes with recurrent pterygia, group B had 20 eyes with primary pterygia, and group C consisted of 78 eyes with primary and 44 eyes with recurrent pterygia. For the above three different surgeries, the amount of tissue removed was estimated from histopathologic analysis, and the result was evaluated by

clinical examination. Recurrence, survival analysis, and final appearance were compared. In group A, the recurrence rate was 10.9%, 37.5%, and 14.8% for primary, recurrent, and all pterygia, respectively (mean follow-up, 11 months). These three rates were significantly higher than 2.6%, 9.1%, and 4.9% noted in group C (mean follow-up, 23 months). However, the latter recurrence rate was significantly lower than 45% (mean follow-up, 5.2 months) in group B for primary pterygia ($P < 0.001$). The onset of recurrence was delayed significantly in group C as compared with that of groups A and B. They concluded that the relatively low recurrence rate for primary pterygia allows one to use amniotic membrane transplantation as an alternative first choice, especially for advanced cases with bilateral heads or those who might need glaucoma surgery later.

Pulte P, Heiligenhaus A, Koch J, Steuhl KP, Waubke T (1998) conducted a study to investigate the long-term efficacy of conjunctiva-limbus autografts to prevent pterygium recurrence. Conjunctiva-limbus transplants for primary (n = 62) or recurrent (n = 8) pterygia were reevaluated 11 to 83 months after surgery (mean: 44.97 months). Corneal pterygium recurrence was observed in 2 cases. Fibrovascular tissue was found at the peripheral transplant-margin in 15 cases, and transplant compression towards the limbal margins was detected in further 7 patients. These conjunctival changes have not been observed during the first postoperative months. They concluded that Conjunctiva-limbus autografts in pterygia have excellent efficacy against recurrence within the first few years. The transplant compression and fibrovascular changes within the peripheral conjunctiva seen in this study suggest that recurrences might, however, develop on the long-term.

Singh G, Wilson MR, Foster CS (1988) observed 48 patients for 7-21 months (mean, 18 months) after pterygium excision and 2 weeks of placebo or

mitomycin topical therapy to evaluate whether or not the short-term efficacy of mitomycin in preventing pterygium recurrence would be reflected in long-lasting efficacy as well. Placebo-treated pterygia showed a 73% recurrence rate. One of 58 (1.7%) mitomycin-treated pterygia recurred. They also performed a pilot study comparing pterygia treated with excision followed by 0.4 mg/ml of mitomycin to pterygia treated with excision coupled with conjunctival autograft transplantation. Thirteen primary and two recurrent pterygia were treated with mitomycin, while 14 primary and 1 recurrent pterygia were treated with conjunctival autograft transplantation. With mean follow-up times of 4 and 6 months, respectively, no recurrences were noted in the mitomycin-treated group, while the conjunctival autograft transplantation group had one recurrence (6.6%). They concluded that the vastly less expensive, simple therapy of mitomycin eye drops is the more appropriate treatment.

Figueiredo RS, Cohen EJ, Gomes JA, Rapuano CJ, Laibson PR (1993) evaluated the efficacy of the surgical management of pterygium with conjunctival autografts. In a retrospective survey, the records of 94 consecutive patients who underwent surgery for pterygium between 1984 and 1993 were reviewed. Only the first pterygium procedure for each patient was included. Thirty-one patients with primary pterygium underwent simple excision. Forty patients had conjunctival autografts. The recurrence rates estimated at 1 year were 40% and 16%, respectively. In both groups, patients who were 50 years old or younger were more likely to have a recurrence. All 23 patients with recurrent pterygium had conjunctival grafts, and the estimation of recurrence at 1 year was 25%. No serious complications occurred in any group. They concluded that Conjunctival autograft decreases the recurrence rate for primary pterygium compared with simple excision.

Du Z, Jiang D, Nie A (2002) conducted a study to observe the therapeutic effects of limbal epithelial autograft transplantation and pterygium excision in the treatment of pterygium. A prospective randomized paired-eye trial was studied. There were 208 patients (229 eyes) with initial pterygium, and they were allocated to two groups: excision of pterygium with limbal epithelial autograft transplantation surgery (A group, 106 cases and 124 eyes) and simple pterygium excision (B group, 102 cases and 105 eyes). The post-operative follow-up periods ranged from 18 approximately 28 (22.4 +/- 4.9) months. 5 of 11 2 eyes (4.5%) in A group and 41 of 96 eyes (42.7%) in B group were recurred, the difference being very significant ($P < 0.001$). They concluded that to provide a new stem cell source, limbal epithelial autograft transplantation, for an injured limbus is a reasonable therapeutic method for the treatment of pterygium.

Starck T, Kenyon KR, Serrano F (1991) conducted a study in which the surgical technique and postoperative problem management of conjunctival autograft transplantation for advanced primary and recurrent pterygium were reviewed. Problems such as graft edema, corneoscleral dellen, and epithelial inclusion cysts infrequently occur. Corneal astigmatism, Tenon's granuloma, retraction and/or necrosis of the graft, and muscular disinsertion are even less frequently encountered. They recommended the use of Limbal-conjunctival autograft for recalcitrant recurrent cases.

Mahar PS (1997) conducted a study to assess the recurrence rate of pterygium with conjunctival autograft versus the use of topical mitomycin C. In 27 eyes undergoing pterygium excision with conjunctival autograft, the recurrence rate was found to be 25.9% after 1 year mean follow-up. In the second group of 32 eyes, pterygium was removed using the bare sclera method. All these patients received post-operatively 0.2 mg/ml (0.02%)

topical mitomycin C twice a day for 5 days. At 1 year mean follow-up, the recurrence rate in this group was 9.4%. Although the difference was not statistically significant, the number of recurrences was lower in the mitomycin-C-treated group than in patients undergoing conjunctival autograft.

Dadeya S, Kamlesh, Khurana C, Fatima S (2002) conducted a study to evaluate the safety and efficacy of intraoperative daunorubicin to compare the recurrence rate following treatment of pterygium with daunorubicin during a bare sclera procedure in primary pterygium surgery and to compare with conjunctival autograft. The data for 84 patients were analyzed retrospectively. The patients were divided into two groups: group A, those who underwent bare sclera excision along with conjunctival autograft, and group B, those who underwent bare sclera excision with intraoperative daunorubicin (0.02%) for 3 minutes. They evaluated pterygium recurrence and postoperative complications for both groups. Recurrence of pterygium was defined as growth of 2 mm of fibrovascular tissue over the corneoscleral limbus into the clear cornea in the area of previous pterygium excision. Follow-up ranged from 18 to 37 months (mean, 27). Recurrence rates of 8.33% (three of 36) and 7.14% (three of 42) were found in groups A and B, respectively. When compared statistically, the difference was not significant. All the recurrences occurred in patients younger than 30 years of age. Pyogenic granuloma, graft edema, loose graft, and dellen formation were seen, respectively, in 5.5% (two of 36), 2.77% (one of 36), 2.77% (one of 36), and 2.77% (one of 36) patients in group A. Nine of 42 (21.42%) patients in group B had chemosis of the conjunctiva and two of 42 (4.76%) had delayed epithelization. They concluded that intraoperative daunorubicin (0.02%) and conjunctival autograft are both equally effective adjuncts to pterygium surgery.

Ti SE, Chee SP, Dear KB, Tan DT (2000) conducted a study to evaluate the success rates of conjunctival autografting for primary and recurrent pterygium performed in a tertiary ophthalmic centre. The outcome of 139 cases with primary pterygia and 64 cases with recurrent pterygia who underwent excision with conjunctival autografting was retrospectively reviewed. Mean follow up was 8.4 months in the primary group, and 9.5 months for the recurrent group. 29 out of 139 cases of primary pterygia recurred (20.8%) while 20 out of 64 cases in the recurrent group (31.2%) recurred. Recurrence rates varied widely among surgeons, ranging from 5% to 82%. Recurrence rates were inversely related to previous experience in performing conjunctival grafting. The recurrence free probability was 84% at 3 months, 73% at 1 year for primary pterygia, and 80% at 3 months, 67% at 1 year for recurrent pterygia. There was no statistical difference in recurrence rates between primary and recurrent groups ($p= 0.80$). They concluded that the success of conjunctival autografting for pterygium in this series varied widely, and may be related to a significant learning curve or differing surgical techniques for this procedure. This may account for the wide variation in reported success of this procedure in the ophthalmic literature.

Hille K, Hoh H, Gross A, Ruprecht KW (1996) reported the outcome after pterygium excision with bare-sclera technique compared with free transplantation of limbal conjunctiva. They used the bare-sclera technique in 21 eyes and performed free transplantation of conjunctiva in 34 eyes. The duration of follow-up was 14 months. In patients operated with the bare-sclera technique there were significantly more recurrences (eight vs four). In patients with primary surgery and free limbal transplant they found no case of recurrence, but the bare-sclera technique was associated with a recurrence rate

of 35.5%.They recommended free limbal conjunctival transplantation even in patients with primary surgery of a pterygium.

Dowlut MS, Laflamme MY (1981) conducted a study in which out of 91 pterygia treated by simple excision followed by beta-irradiation 7 recurred. Of 15 recurrent pterygia treated by complete excision by the bare-sclera technique associated with a conjunctival autograft only 1 recurred again. They concluded that conjunctival autografting is simple and efficacious, and gives very good esthetic results in cases of recurrent pterygium.

Guler M, Sobaci G, Ilker S, Ozturk F, Mutlu FM, Yildirim E(1994) conducted a study to evaluate limbal conjunctival autotransplantation in the management of cases with recurrent pterygium. At present, new surgical techniques to prevent pterygium recurrence following surgery are in investigation. In recent years, it has been postulated that pterygium is due to hypofunction of limbal stem cells. Thirty-one out of 49 patients with recurrent pterygium were treated by limbal-conjunctival autograft transplantation and the other 18 treated by Czermak technique, including two line of limbal cauterization intraoperatively, and used as a control group. During a mean follow-up period of 10 months (ranging 3-18 months), 4 recurrences (13.3%) in the limbal-conjunctival autograft transplantation group and 9 recurrences (50%) in the control group were observed. They concluded that this is a successful method to prevent secondary recurrence in the management of recurrent pterygium patients under 40 years of age.

Shimazaki J, Yang HY, Tsubota K (1996) conducted a study to examine the usefulness of limbal autograft transplantation in the treatment of recurrent and advanced pterygia. Eleven patients with recurrent and 16 with advanced pterygia were treated with limbal autograft transplantation. Once a pterygium had been excised, superior limbal tissue was taken with

conjunctival flap and transferred to the excised area. All the grafts were planted promptly, and donor sites were re-epithelialized with no excessive scar tissue formation. Although slight recurrence was noted in 2 eyes (7.4%), subconjunctival tissue invasions were limited to less than 1 mm, and no further surgical interventions were needed. These results indicate that limbal autograft transplantation is very effective for the treatment of recurrent and advanced pterygia.

Kmiha N, Kamoun B, Trigui A, Jelliti B, Fourati M, Chaabouni M (2001)conducted a prospective study of 52 eyes treated by limbal conjunctival autograft for primary and recurrent pterygium compared their results with the technique of simple excision performed in 111 cases of pterygium (3 being a recurrent pterygium). The mean age of the patients was 45 years. 30 cases of pterygium were primary (57.7%) and 22 were recurrent (42.3%). After an average follow-up of 14 months, the incidence of recurrence was 10%. Only 2 of these recurrent cases of pterygium were primary. They concluded that the introduction of limbal conjunctival autograft for the treatment of pterygium meets three main goals: safety, good optical outcome and a lower rate of recurrence. This procedure could be accepted as a successful technique for cases with recurrent pterygium especially in younger patients and when the environmental factors lower the development of recurrent pterygium.

H S Dua, J S Saini, A Azuara-Blanco, P Gupta (2000) presented the Concept, Etiology, Clinical Presentation, Diagnosis and Management of Limbal Stem Cell Deficiency. Defects in renewal and repair of ocular surface as a result of limbal stem cell deficiency are now known to cause varying ocular surface morbidity including persistent photophobia, repeated and persistent surface breakdown and overt conjunctivalisation of the cornea. Ocular conditions with abnormalities of ocular surface repair include

pterygium, limbal tumours, aniridia, severe scarring following burns, cicatricial pemphigoid and Stevens-Johnson Syndrome etc. The corneal epithelium undergoes a constant process of cell renewal and regeneration. Cells in its uppermost layer are continuously desquamated and lost into the tear film, and must be replaced by cell proliferation. Therefore it is endowed with a proliferative reserve in the form of multipotent stem cells located in the basal limbal epithelium. The limbal stem cells serve as a proliferative barrier between corneal and conjunctival epithelia. Conditions that significantly damage the limbal stem cells can result in an invasion of conjunctival epithelium on to the corneal surface (conjunctivalisation). This process of conjunctivalisation results in a thickened, irregular, unstable epithelium, often with secondary neovascularisation and inflammatory cell infiltration. Epithelial defects are common in the conjunctivalised corneal surface and may lead to corneal ulceration, scarring, and loss of vision. Defects in renewal and repair of ocular surface as a result of limbal stem cell deficiency are now known to cause varying ocular surface morbidity including persistent photophobia, repeated and persistent surface breakdown and overt conjunctivalisation of the cornea in conditions like pterygium.

Rao SK, Lekha T, Mukesh BN, Sitalakshmi G, Padmanabhan P (1994) described their technique of pterygium excision with conjunctival-limbal autografting and analyzed the safety and efficacy of the procedure in India. Case records of 51 consecutive patients (53 eyes) who underwent surgery between November 1992 and September 1994 were retrospectively analyzed. Recurrence was defined as fibrovascular tissue crossing the corneoscleral limbus onto clear cornea in the area of previous pterygium excision. 2 (3.8%) of the 53 pterygia (primary 36; recurrent 17) recurred, after a mean follow up of 18.9 +/- 12.1 months (range: 1.5-43 months). Both

recurrences occurred within a year of follow up, in patients who were < or = 40 years of age. No major operative or postoperative complications were encountered. The inclusion of limbal tissue in conjunctival autografts following pterygium excision appears to be essential to ensure low recurrence rates. They concluded that the technique is safe, simple and inexpensive and is recommended for the management of both primary and recurrent pterygia in Indian eyes.

Ayman A. Alkawas, Wael Osman El-Haig, Bahgat Awad (2002) conducted a study to evaluate the effectiveness of limbal conjunctival autograft transplantation versus intraoperative mitomycin C combined with conjunctival flap rotation in the treatment of recurrent pterygia. This study included 43 eyes of 43 patients. Limbal conjunctival autograft transplantation was carried out for 19 eyes (group 1) and intraoperative mitomycin C combined with conjunctival flap rotation in 24 eyes (group 2).During a mean follow-up period of 8.3 months, pterygium recurrence developed in 3 eyes (15.8%) in group 1 and in 4 eyes (16.7%) in group 2. Most recurrences occurred in patients younger than 40 years old. No intraoperative complications were encountered in both groups. Postoperative complications in group 1 included Tenon's granuloma in 3 eyes (15.8%), graft failure in 1 eye (5.3%), graft retraction in 1 eye (5.3%), and subconjunctival hematoma in 2 eyes (10.5%). Postoperative complications in group 2 included, flap retraction in 2 eyes (8.3%) and superficial keratitis in 5 eyes (20.8%).They concluded that both limbal conjunctival autograft transplantation and conjunctival flap rotation with intraoperative mitomycin C application are effective in managing recurrent pterygia. The recurrence rate is similar for both techniques. The inclusion of limbal tissue in conjunctival autografts

replaces the deficient limbal stem cells in the area of the pterygium and ensures low recurrence rates. Intraoperative mitomycin C with conjunctival flap rotation is, however, easier to perform, but the long-term safety of mitomycin C needs further study.

K. Dutschke, J. Willner, H. Siebenbürger, M. Flentje (2001) conducted a study to observe the results of pre- and postoperative treatment of recurrent pterygium with radiotherapy.16 patients with recurrent pterygia were treated with radiotherapy. Out of those patients 12 (2 women, 10 men) with a minimum follow-up of one year were included in this study. A total dose of 27 Gy was applied with a 20 KV contact x-ray unit. The first radiation was given within 2-5 hours with 7 Gy before microsurgical excision and conjunctival autograft transplantation. During the following 4-9 days 4 fractions with 5 Gy each were applied. After a median follow-up of 15 months 8 out of 12 patients had no recurrence of pterygium at all. Four patients developed a recurrent pterygium with no need for surgery. Compared to a historical collective with only postoperative radiotherapy, recurrence rate was clearly reduced. Serious complications like wound healing disturbances, scleral necrosis, and infection did not occur. They concluded that pre- and postoperative radiotherapy of recurrent pterygium in combination with microsurgical excision and conjunctival autograft transplantation is an effective therapeutic option with so far good long-term results.

Neußer, U. Gronemeyer(1999) conducted a study to receive long-term results (mean follow-up: 2 years) regarding the recurrence rate and the morphological characteristics of recurrent pterygia in order to improve the surgical technique of pterygium excision combined with conjunctival autografting. From 1995 to 1997 pterygium excision was performed with free

conjunctival autograft in 51 eyes out of 46 patients. Recurrence rate was 19.5 %. Analysis of morphologic characteristics of recurrent pterygia revealed that transplants had been either too small or not thin enough. There were no serious complications. They concluded that pterygium excision with conjunctival autografting is safe and effective. To avoid recurrence the transplant should be extremely thin, large enough and sutured to the sclera.

Regis S. Figueiredo; Elisabeth J. Cohen; Jose A. P. Gomes; Christopher J. Rapuano; Peter R. Laibson(1997) conducted a study to evaluate the efficacy of the surgical management of pterygium with conjunctival autograft was evaluated. In a retrospective survey, the records of 94 consecutive patients who underwent surgery for pterygium between 1984 and 1993 were reviewed. Only the first pterygium procedure for each patient was included. Thirty-one patients with primary pterygium underwent simple excision. Forty patients had conjunctival autografts. The recurrence rates estimated at 1 year were 40% and 16%, respectively (P = .031). In both groups, patients who were 50 years old or younger were more likely to have a recurrence (P = .029). All 23 patients with recurrent pterygium had conjunctival grafts, and the estimation of recurrence at 1 year was 25%. No serious complications occurred in any group. They concluded that Conjunctival autograft decreases the recurrence rate for primary pterygium compared with simple excision.

Manolette Roque; Ruben Limbonsiong, conducted a study to investigate the rate of recurrence and the complications after resection of primary and recurrent pterygia using bare sclera with conjunctival autograft, and to find out if the results mirror that in Western studies. Thirteen patients underwent pterygium excision onto bare sclera with conjunctival autograft.

The recurrence rate after conjunctival autograft was 8.3% after mean follow-up of 5.2 months. Increasing age was associated with significantly fewer recurrences after controlling for pterygium type (atrophic, noninflamed, or inflamed). The recurrent case was noted on the 7th month. Complications included a loose autograft (1) and subconjunctival (below the graft) hemorrhage (1). They concluded that Pterygium excision with conjunctival autograft promises to be a better procedure for the prevention of recurrence compared to simple bare sclera excision reported in literature.

The surgical problems associated with conjunctival autograft transplantation have been reviewed by ***Stark T, Kenyon K R, and Serrano F (1991)*** as follows:

SURGICAL COMPLICATIONS AND MANAGEMENT

CONJUNCTIVAL GRAFT EDEMA

The edema of the conjunctival graft is usually within the first 10 postoperative days. The several possible causes for the conjunctival graft edema include excessive surgical manipulation, inadequate Tenon's excision, poor graft orientation, young patients, and hematoma of the graft. Although such edema usually resolves within 2-4weeks, severe or persistent graft edema may be reduced by performing several small, vertical puncture incisions in the graft with a scalpel blade followed by compression of the serous fluid with a cotton-tip applicator.

EXCESSIVE SURGICAL MANIPULATION

We believe that minimal surgical manipulation and avoidance of drying during surgery improves the recovery of the graft in the immediate postoperative period.

TENON'S EXCISION

Because Tenon's capsule might enable the conjunctiva to slide over the cornea in the establishment of the pterygia, a careful excision of Tenon's from the graft tissue and from the recipient bed should be performed. Notably, young patients have a high risk of pterygium recurrence and early postoperative conjunctival graft edema, presumably because of the presence of increased and highly reactive Tenon's tissue, and therefore must be treated more "aggressively". The retention of Tenon's tissue with the concomitant vessels and collagen tissue within the graft clinically seems to increase the immediate postoperative graft edema.

GRAFT ORIENTATION

To maintain the anatomical integrity and exert a prohibitive growth pressure against conjunctival epithelial invasion, the epithelium of the graft must have the same orientation as that of the host conjunctiva, and the limbal side should correspond to the position of the limbus in the host bed.

CONJUNCTIVAL GRAFT RETRACTION

Retraction or displacement of conjunctival graft involves a partial shift of the graft with exposure of the bare scleral bed. The sutures are partially or

totally absent. The main causes for graft retraction are excessive Tenon's tissue, inadequate graft size, and graft tissue quality.

INADEQUATE GRAFT SIZE:

Shrinkage of the graft can also occur when there is a disparity in size between it and the host bed. If the graft is too small to cover the recipient bed completely, the sutures are subjected to high tension, thereby cutting through the tissue and leaving the graft without support. Undersized grafts are also probably associated with pterygium recurrence, thereby allowing the residual pterygium to "outflank" the graft barrier. Because grafts as large as 15 x15 mm can be taken without risk to either graft viability or donor site, there should be no need to undersize the graft.

GRAFT TISSUE QUALITY

When the donor tissue used for the graft has been involved in cicatricial processes including trauma, surgery, infection, or inflammatory reaction, there is an increased amount of fibrous and inflammatory tissue. This can promote early shrinkage of the graft. If the fellow eye is in better condition it is preferable to use its conjunctiva as donor tissue. In patients with bilateral fibroinflammatory involvement, the use of buccal mucous grafts must be considered.

CONJUNCTIVAL GRAFT NECROSIS

The main reasons for necrosis of the graft are incorrect placement of the graft and avascular scleral bed.

Incorrect Graft Placement

If the graft is inadvertently inverted such that the epithelium is apposed to the sclera, the graft will fail. Excessive manipulation of the graft during surgery increases the risk of an equivocal placement. Retaining the attachment of the graft at the limbus during dissection contributes to the control of orientation. Another way to avoid this "down-side risk" is to mark with cautery the conjunctival epithelial margin of the graft before excision. If these marks are preserved within the graft margins, they can be easily recognized. This marking technique is also useful to allow precise sizing of the graft before commencement of its dissection.

The first postoperative clue to suspecting inversion of the graft is an abnormal pallor, because the malpositioned graft with shrink and become necrotic within 24-48 h. In these cases, the management varies depending on the size of the scleral bed exposed and on the age of the patient. In some cases of older patients with minimal scleral bed exposure, the exposed area can be left to close by secondary intention, as has been previously practiced. In younger patients with moderate to large exposure of the sclera and high risk of recurrence, it is better to replace the graft with conjunctiva from the fellow eye or with a buccal mucous graft.

Vascular Scleral Bed

In cases in which β radiation therapy has been used in repeated courses with overlapping fields, scleral ulceration is frequent, the chronic melting, thinning, and presence of abnormal vascular pattern can be the cause of delay in graft healing. Thus, the risks of graft necrosis are increased. When the corneoscleral bed is thin and has profound disruption of the vascular pattern, a lamellar corneal or corneoscleral keratoplasty or scleral reinforcement is indicated. This can be performed simultaneously in conjunction with the

conjunctival graft. In less severe cases, the use of a conjunctival graft alone fulfills the requirements for normal healing.

CORNEOSCLERAL DELLEN

The formation of an area of desiccation over the cornea, limbus, or even the sclera is not infrequent. As mentioned previously, excessive manipulation during surgery causes conjunctival graft edema. This edema raises the lid, creating an abnormal spread of the tear film that together with an irregular surface causes an area of desiccation and dellen formation. Postoperatively, the use of frequent artificial tears and lubricating ointments, in conjunction with steroid drugs in drops three to four times a day , helps to avoid the dellen formation . Once the dellen is formed, eye patching with concomitant use of antibiotic ointment for 24-48 h usually permits the healing of the compromised area. If the dellen is associated with marked conjunctival graft edema, several vertical puncture incisions of the graft help to flatten the graft and regularize the surface, thereby improving the spread of the tear film.

EPITHELIAL CYSTS

Epithelial cysts usually appear approximately 1 or 2 months after surgery. It is important after using the diamond-burr polisher or the manual technique to flush the area abundantly with saline, because retention of some corneal epithelial cells with consequent implantation in the conjunctival tissue is the main cause of this minor problem. Such cysts are innocuous, but their recurrence is high after puncturing. Marsupialization is the treatment of choice, and involves opening the cyst with concomitant resection of the overlapping conjunctiva.

HEMATOMAS

During surgery or more often early after surgery, hemorrhage or hematomas can appear in or under the graft, causing severe edema. This is often related to poor hemostasis. The hemostasis of the episcleral and Tenon's- conjunctival tissues must be enough but not excessive, avoiding increase of irregularities and scar formation in the receptor tissues. Hemostasis with a heated glass rod is very smooth and superficial for the bare sclera. Unipolar or bipolar thermal cautery is better for pinpoint bleeding of conjunctival or Tenon's vessels. Small hematomas usually resolve within 3 weeks without any treatment. In the presence of a large hematoma beneath the graft, the best management consists of drainage by puncturing with a fine needle, followed by a pressure patch to prevent the possibility of rebleeding. If the hematoma is left untreated, elevation of the graft can cause surface irregularity and dellen formation. Also, it can increase the tension of the sutures, with the risk of dehiscence and possibly displacement or loss of the graft.

TENON'S GRANULOMA

The Tenon's granuloma has a clinical picture of granuloma pyogenicum. There are several causes for Tenon's proliferation. The abnormal exposure of Tenon's tissue without an adequate cover by the conjunctival tissue causes a permanent irritative stimulus, leading to an overgrowth of the exposed tissues. The phenomenon occurs more frequently at the donor site, but also can occur at the recipient bed. Although the former is usually secondary to Tenon's exposure with out adequate conjunctival covering, the

latter is mainly due to inadequate technique with the graft, such as too few or too tight sutures or inverse placement of the graft. In either case, the final result is an excessive overgrowth of Tenon's tissue overlapping the conjunctival graft, thereby inciting the recurrence of the pterygium. Treatment usually involves surgical excision and conjunctival autograft transplantation, with excellent results. The granulomatous reaction also can occur when small particles of reactive suture material remain included under the conjunctiva, inducing a foreign-body reaction. In our experience, the least reactive material is the 10-0 nylon. Although granulomas can be treated by increasing topical steroid drugs, they usually have to be excised. Because most are pedunculated, the excision is extremely straightforward, does not compromise the underlying conjunctiva, and is not associated with graft failure.

MUSCULAR DISINSERTION

Disinsertion of a medial or lateral rectus muscle rarely happens. The patients at greatest risk are those with recurrent pterygia after multiple surgeries and severe scarring involving the rectus muscle resulting in extraocular movement restriction. Thus, it is mandatory to dissect and isolate the muscle carefully with a hook and/or traction suture before the Tenon's and conjunctival excision is done. If the muscle disinsertion occurs, it should be resutured in its normal position. If adequately recognized and managed intraoperatively, there is no contraindication to proceed with the conjunctival graft.

CORNEAL THINNING

Corneal thinning is also more often encountered in recurrent pterygia. In these cases, the previous use of several keratectomies is the main cause. It is very rare to find corneal thinning induced by the diamond-burr polisher. In those cases in which it can be inferred by past history or slit-lamp examination that corneal thinning is present, we prefer first to do a tectonic lamellar corneal or corneoscleral graft. For this purpose, a donor eye should be available for potential use during surgery.

ASTIGMATISM

In general, patients with either primary or recurrent pterygia can develop astigmatism as high as 7diopters as is evident by refraction or keratometry. This astigmatism is induced by traction of the pterygia over the cornea, and when the pterygia are excised the astigmatism usually subsides. If the cause of astigmatism is corneal tissue loss, the therapy should be directed to reinforcing the tissues by lamellar corneoscleral graft. Once this has been achieved, it is recommended to wait at least 6 months before any attempt is made to correct the residual astigmatism.

RECURRENCE

At the present time, the recurrence rate of pterygium with conjunctival autograft technique varies between 2 and 7%. This low rate of recurrence is especially noteworthy because it pertains to the pterygium endemic to tropical areas as well as to less pterygium-provocative northern latitudes. Recurrence is usually evident in the first 2 postoperative months. Reintervention for recurrent pterygium has to be delayed at least 6 months after the first surgery,

to wait for complete resolution of the inflammatory and cicatricial process. In those difficult cases in which there is no apparent reason for multiple recurrences, it can be related to permanent, abnormal derangement of the anatomical structures at the limbus with severe depletion of stem–cell reservoir.

*****

AIMS AND OBJECTIVES

AIMS AND OBJECTIVES

The present clinical study was undertaken to evaluate the following three fold objectives:

1. To determine the rate of recurrence of primary & recurrent pterygia after conjunctival-limbal autograft surgery.

2. To assess the improvement in visual acuity after surgery in cases with advanced pterygia.

3. To determine the occurrence of any intraoperative & post-operative complications.

*****

MATERIALS AND METHODS

MATERIAL AND METHODS

The present prospective study was carried out at the Department of Ophthalmology, M.L.B. Medical College, Jhansi. 48 patients with either primary or recurrent pterygia were selected from those attending the eye OPD between March 2001 to April 2002. The criteria for eligibility were as follows:-

1. Pterygium growth over the cornea of more than 3 mm
2. No other ocular surface pathology present.
3. At least 6 months should have passed after the last operation in cases of recurrent pterygia.
4. Any infection on the ocular surface or a systemic pathology, which might be a contraindication for ocular surgery.
5. Complaints despite topical treatment with 1 % prednisolone acetate eye drops & a lubricating agent polyvinyl alcohol q.i.d. for 15 days.

After an informed consent patient data including the demographic factors, previous medical, surgical and ocular history were recorded. Best corrected visual acuity (BCVA) before and after surgery were recorded. The characteristics of the pterygia were recorded as follows:

1. Type of pterygium:
    - Primary
    - Recurrent
2. Site
3. Extent
4. Vascularization
5. Site of graft

6. Complications

7. Recurrence

All patients underwent pterygium excision with conjunctival Limbal autograft transplantation.

SURGICAL TECHNIQUE

A standard surgical technique essentially similar to that described by Kenyon et al was performed. The surgical technique involves transferring a free graft of superior bulbar conjunctiva to cover the sclera exposed by pterygium excision and fornix reconstruction. All surgeries were performed under operating microscope and peribulbar anaesthesia.

A rigid lid speculum is used to provide maximal exposure. A superior rectus bridle suture is given to abduct the eye maximally (assuming nasal pterygium) and multiple cautery spots are used to delineate the involved area of conjunctiva, over the pterygium, to be excised.

Beginning at the head of the pterygium, a disposable Bard-Parker blade is used to superficially excise the involved area of cornea to the limbus. Spring action Westcott's Scissors are used for complete circumscision of the conjunctiva at the cautery marks. With blunt dissection, the conjunctiva and Tenon's capsule are freed from the horizontal rectus muscle. Extraocular muscles are identified with a muscle hook and, if necessary, isolated with traction sutures. Especially in recurrent cases, the muscles can become enmeshed in scar tissue, and unless dissected meticulously, can be damaged or severed. Complete resection is done of involved conjunctiva, tenon's capsule and cicatrix; the bare sclera and rectus muscle remain exposed. To preserve vascularity of the graft bed, cautery was minimized and a diamond burr was

not used to polish the involved limbus and cornea. Limbus was polished by the same Bard-Parker blade no.15 and no lamellar keratectomy was done in any case. The size of the conjunctival graft required to resurface the exposed sclera and horizontal rectus muscle is determined with Castroviejo calipers. The globe is rotated inferomedially by pulling on the superior rectus bridle suture to expose the uninvolved superior bulbar conjunctiva. The graft dimensions are marked with several cautery spots. Free grafts as large as 15x15 mm, and extending to the limbus can be prepared and, used without difficulty.

With sharp, spring-action scissors, the graft is dissected as thinly as possible in the same manner as a thin conjunctival flap, by taking minimal subconjunctival tissue; the episclera and tenon's capsule remain intact. The donor site requires no suturing or a single suture may be applied and the site will heal rapidly, without scarring. Also, the graft is more elastic and will heal with less shrinkage. If the graft is excised such that cautery marks remain within the graft tissue margins, then the epithelial surface can be identified when the graft is repositioned. The eye is abducted and the free graft transferred onto the recipient bed without lifting it up from the limbus but just by rotating it across the limbus, so as to prevent inrolling of the margins and inversion of the surfaces of the graft. The graft is anchored in a limbus-limbus orientation and is secured to adjacent conjunctiva and episclera with approximately 6-8 interrupted 10-0 monofilament nylon sutures. No sutures are given on the limbal side of the graft. Postoperatively, all patients received prednisolone acetate 1% eye drops every 2 hours while awake and Tobramycin 0.3% and Dexamethasone 0.1% eye ointment at night, both of which were tapered off in 1 month's time. Sutures were removed in 3 weeks time. There were no restrictions on patients' activity. Conjunctival grafts

revascularise within 3-5 days and become adherent to the sclera prior to suture removal. Topical steroids ointment is continued for about 2 months postoperatively or longer, if inflammation persists. BCVA was measured after 3 weeks of surgery.

*****

OBSERVATIONS

OBSERVATIONS

The present study, "Conjunctival-limbal autografts for primary and recurrent pterygia" was carried out in the department of Ophthalmology, M.L.B. Medical College, Jhansi. During this period 48 patients with either primary or recurrent pterygia were studied, all of which were operated by the above said procedure. Postoperatively the follow up period ranged from 3 to 12 months with a mean of 10 months.

In this study of 48 patients with pterygia operated by various units of our department 40 patients had primary pterygia while 8 patients had recurrent pterygia.

TYPE OF PTERYGIA AS PER CASES

TYPE OF PTERYGIUM	NO. OF CASES	%
PRIMARY	40	83.3
RECURRENT	08	16.7
TOTAL	**48**	**100**

TABLE-1

These cases were further subdivided morphologically into atrophic, noninflammed and inflamed pterygia.

INCIDENCE OF VARIOUS SUB-TYPES OF PTERIGIUM

SUB-TYPES OF PTERYGIUM	NO. OF CASES	%
GRADE-I (ATROPHIC)	12	25.0
GRADE-II (NON-INFLAMMED)	28	58.3
GRADE-III (INFLAMMED/ ACTIVELY GROWING)	08	16.7
Total	**48**	**100**

TABLE-2

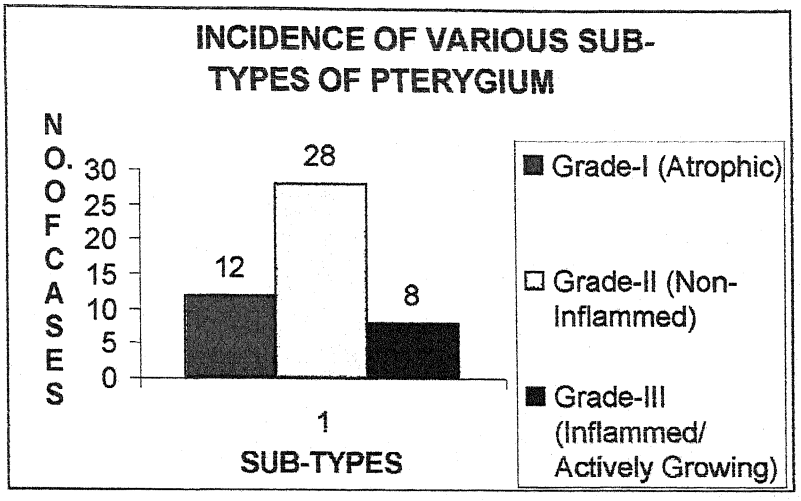


CHART-1

SEX DISTRIBUTION:

SEX DISTRIBUTION AS PER CASES

SEX	NO. OF CASES	PERCENTAGE (%)
MALE	30	62.5
FEMALE	18	37.5
TOTAL	**48**	**100**

TABLE-3

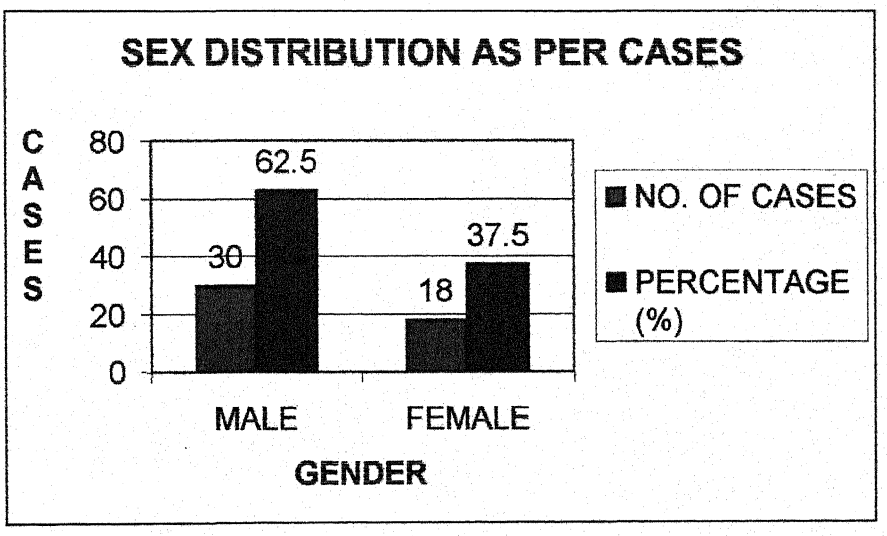


CHART-2

There was a predilection among males due to the predominantly outdoor nature of their work. Among the females, 70% of those affected were involved in regular outdoor work (mostly agriculture workers).

AGE:

The youngest patient in the study was a 43 year old male with an inflamed Grade III type of pterygium while the oldest patient was a 65 year old male with an atrophic Grade I type of pterygium growth. The age-wise analysis is as follows:

AGE DISTRIBUTION AS PER CASES

AGE(YRS)	NO. OF CASES			TOTAL	%
	GR-I	GR-II	GR-III		
<45	0	0	4	4	8
46-50	0	6	4	10	21
51-55	0	8	0	8	17
56-60	6	14	0	20	41
>60	6	0	0	6	13
TOTAL	**12**	**28**	**8**	**48**	**100**

TABLE-4

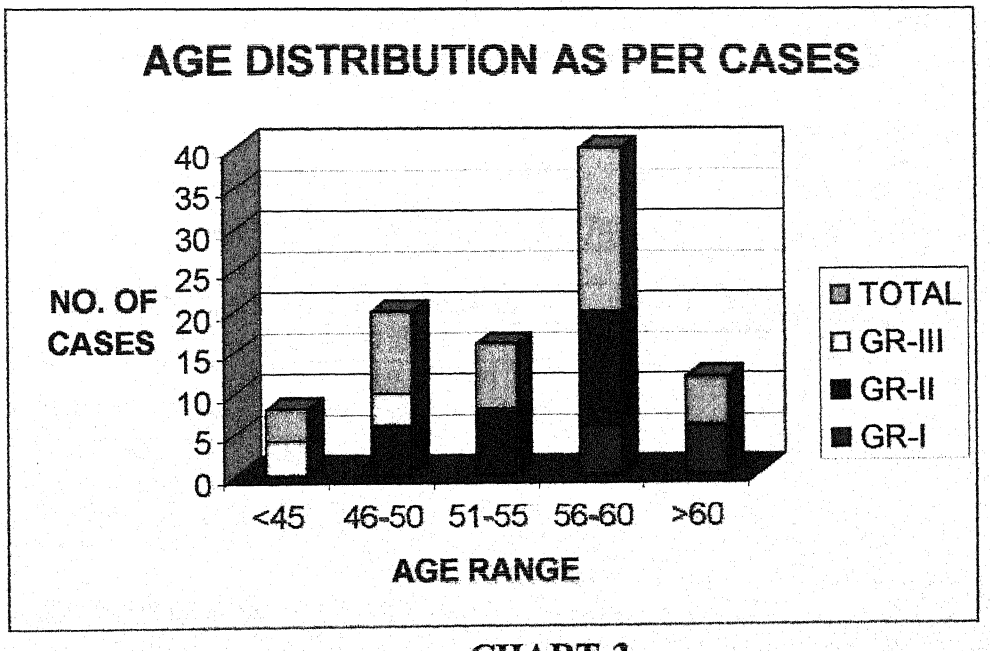


CHART-3

SITE:

SITE OF PTERYGIUM AS PER CASES

SITE OF PTERYGIUM	NO. OF CASES
NASAL	43
TEMPORAL	03
BILATERAL	02
TOTAL	**48**

TABLE-5

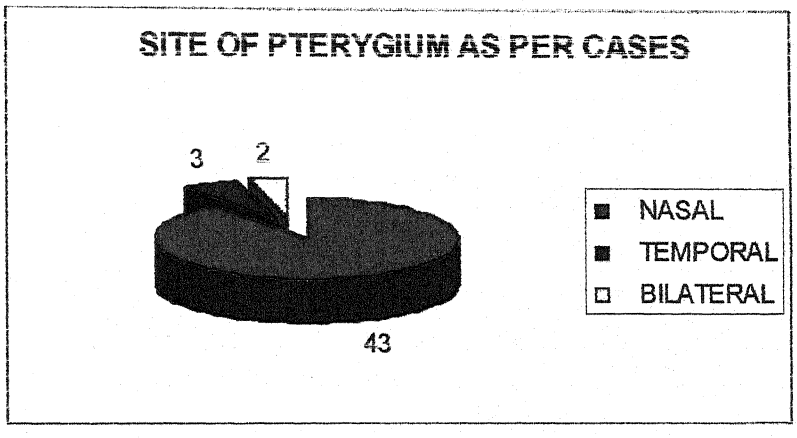


CHART-3

A predominant 43 patients had nasal pterygia, 3 had temporal growth while 2 patients had bilateral growth.

EXTENT:

EXTENT OF PTERYGIUM AS PER CASES

EXTENT OF PTERYGIUM	NO. OF CASES
ACROSS THE LIMBUS	18
MIDWAY B/W LIMBUS & PUPIL	29
ACROSS THE PUPIL	01
TOTAL	**48**

TABLE-6

In 18 patients pterygium had grown across the limbus, in 29 patients it was mid-way between the limbus and the pupil while in one case the growth was across the pupil.

VASCULARISATION:

VASCULARISATION OF PTERYGIUM

VASCULARISATION	NO. OF CASES	%
MILD	14	29
MODERATE	26	54
SEVERE	08	17
TOTAL	**48**	**100**

TABLE-7

SITE OF GRAFT:

SITE OF DONOR GRAFT AS PER CASES

SITE OF GRAFT	NO. OF CASES	%
SUPERO-TEMPORAL QUADRANT	45	93.7
SUPERO-NASAL QUADRANT	03	6.3
TOTAL	**48**	**100**

TABLE-8

CONDITION OF THE FELLOW EYE

The fellow eye was also examined simultaneously examined. Bilateral pterygium was found in 78% of the patients indicating the high incidence of pterygium in this region due to high levels of exposure to Ultraviolet radiation. 18 % of the patients had a pinguecula in the other eye, thus reinforcing the common etiology of degenerative changes due to actinic exposure in both pterygium and pinguecula in areas with dry, dusty and windy climates.

CONDITION OF THE OTHER EYE

CONDITIONS	NO.OF EYES	%
PTERYGIUM	36	75
PINGUECULA	07	14.6
NORMAL	05	10.4
TOTAL	**48**	**100**

TABLE-9

PRE-OPERATIVE VISUAL ACUITY:

The pre-operative visual acuity was affected due to corneal opacity, direct obstruction of the visual pathway at the pupil and astigmatism induced by the fibrovascular tissue. It was recorded in all the cases undergoing surgery. The following table shows the pre-operative visual acuity of the patients in the study:

PRE-OPERATIVE VISUAL ACUITY AS PER CASES

VISUAL ACUITY	NO. OF CASES	%
6/12 or better	12	25.0
6/18- 6/24	28	58.4
6/36 – 6/60	07	14.6
6/60 or less	01	02.0
hand movement	00	00.0
TOTAL	**48**	**100**

TABLE-10

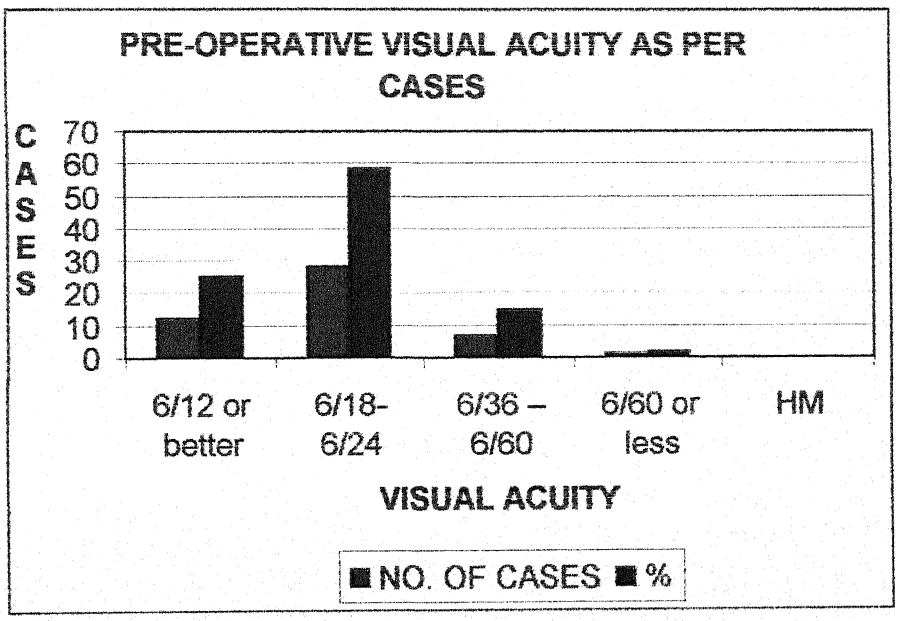


CHART-4

This table shows that out of the pre-operative visual acuity of 41 cases, 12cases (25%) had visual acuity 6/12 or better, 28cases(58.4%) had

This table shows that out of the pre-operative visual acuity of 41 cases, 12cases (25%) had visual acuity 6/12 or better, 28cases(58.4%) had 6/18 to 6/24, 7 (14.6%) had 6/36 to 6/60 and only one had visual acuity 6/60 or less while none had visual acuity of hand movement.

POST-OPERATIVE VISUAL ACUITY:

The following table shows the effects on visual acuity by surgery measured in terms of lines of visual acuity changed postoperatively.

POST-OPERATIVE VISUAL ACUITY

PRE-OPERATIVE VISUAL ACUITY	NO. OF CASES	POST-OPERATIVE VISUAL ACUITY				
		6/12 OR BETTER	6/18 -6/24	6/36 -6/60	<6/60	HM
6/12 OR BETTER	12	12	00	00	00	00
6/18 - 6/24	28	05	22	10	00	00
6/36 – 6/60	07	00	04	03	00	00
LESS THAN 6/60	01	00	01	00	00	00
T HAND MOVEMENT	00	00	00	00	00	00
TOTAL	**48**	**17**	**27**	**04**	**00**	**00**

TABLE-11

Of the 41 patients, 37 (77%) had no change in visual acuity, 8 patients(16.6%) had an improvement of one Snellen's line, 2 patients(4.16%) had an improvement of two Snellen's lines. In these cases the pterygium had fully encroached over the pupillary area and on excision, resulted in a marked improvement in visual acuity. 1 patient (2%) had a reduction of one Snellen's line of visual acuity. This patient had recurrent pterygia and treatment resulted in more astigmatism due to fibrosis, although there was no recurrence of pterygium in this case.

COMPLICATIONS:

The various complications which occurred intra or post operatively have been recorded in the table below:

COMPLICATIONS

COMPLICATIONS	NO.OF CASES
GRAFT EDEMA	10 (20.8%)
LOOSE AUTOGRAFT	3 (6.2%)
GRAFT RETRACTION	0
GRAFT NECROSIS	0
CORNEO-SCLERAL DELLEN	1 (2%)
EPITHELIAL CYSTS	2 (4%)
HEMATOMAS / HGE.	5 (10.4%)
TENONS GRANULOMA	0
MUSCULAR DISINSERTION	0
CORNEAL THINNING	0
SYMBLEPHARON	0
TOTAL	**21(43.7%)**

TABLE-12

RECURRENCE:

Recurrence, defined as fibrovascular tissue crossing the corneoscleral limbus onto clear cornea in an area of previous pterygium excision, occurred in only three cases as follows:

RECURRENCE AFTER SURGERY

	NO OF CASES	RECURRENCE	%
PRIMARY PTERIGIUM	40	02	5
RECURRENT PTERIGIUM	08	01	12.5
TOTAL	**48**	**03**	**6.25**

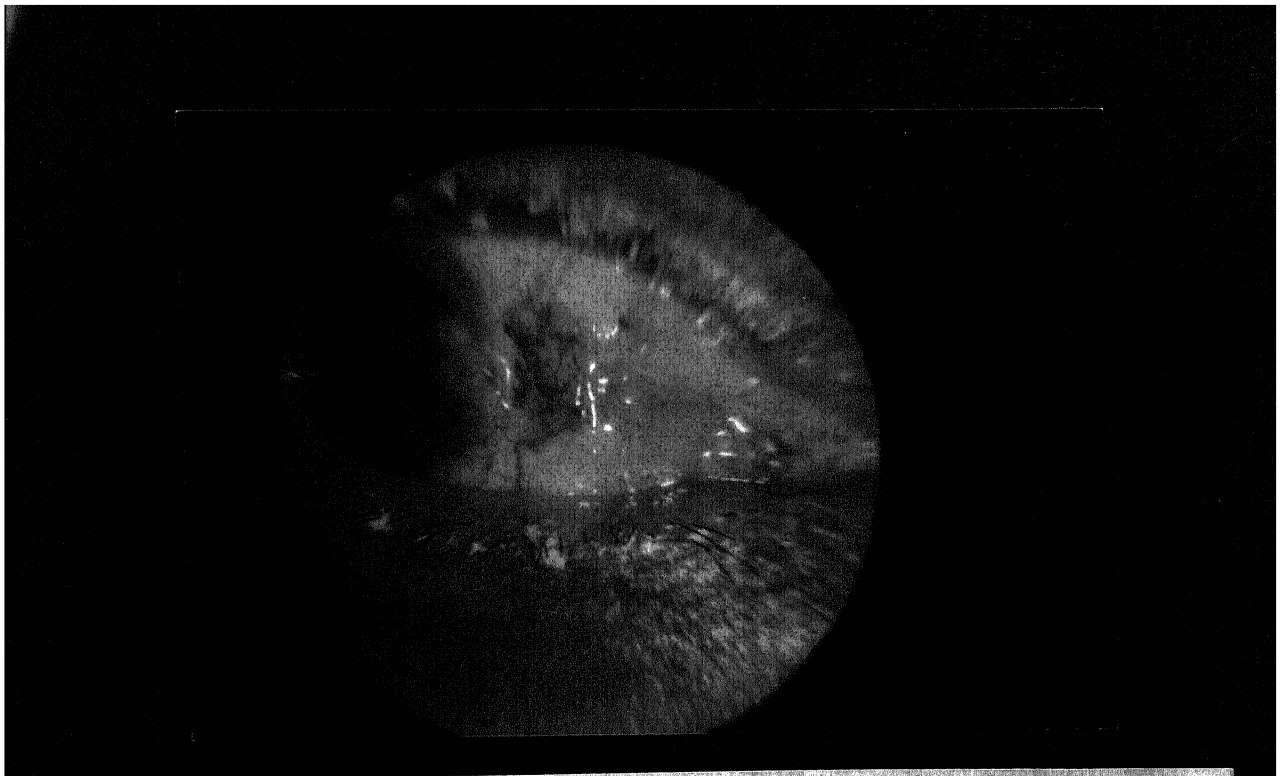
TABLE-13

RECURRENCE AS PER GRADES OF PTERYGIUM

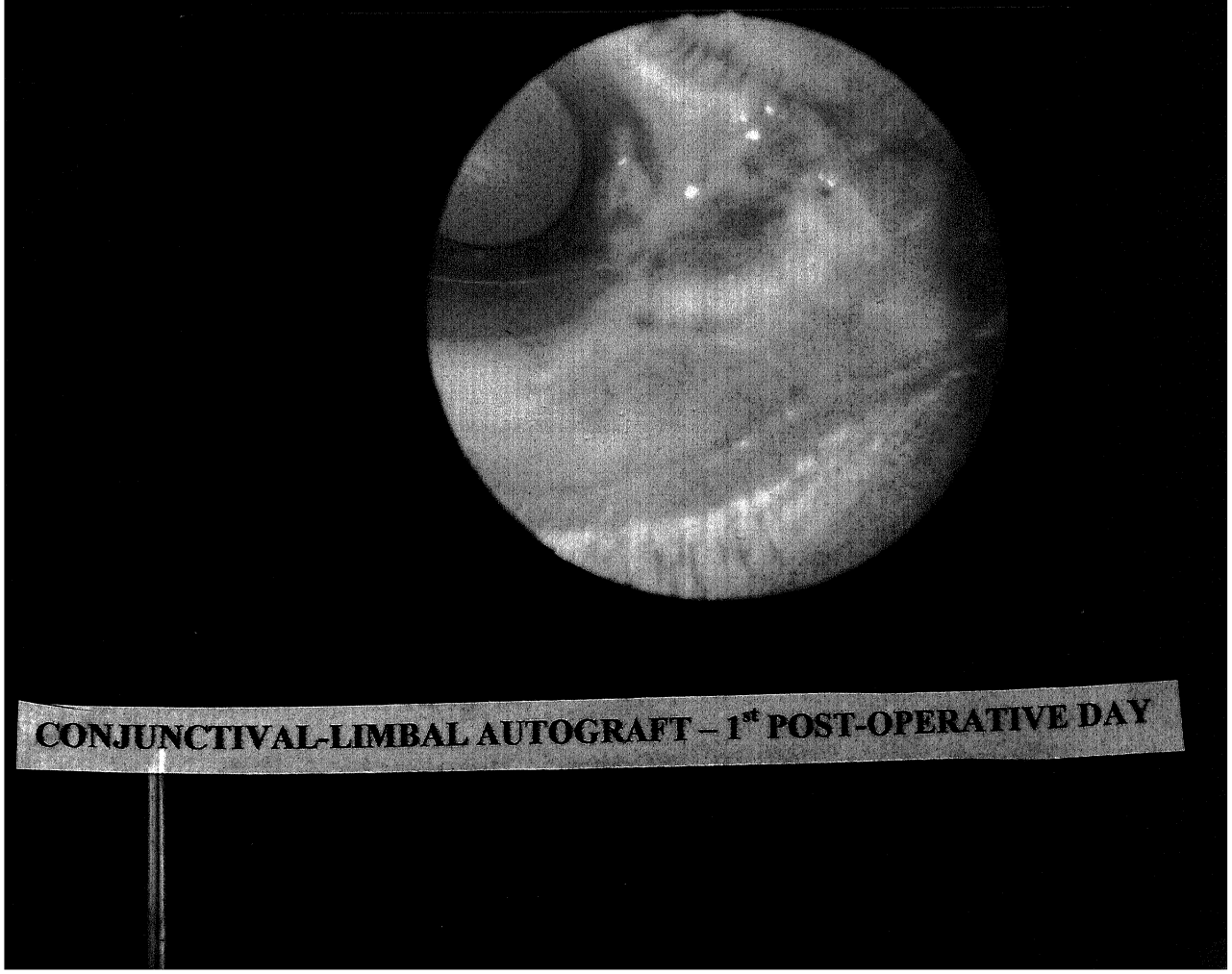
	NO. OF CASES	RECURRENCE	%
GRADE-I	12	00	00
GRADE-II	22	01	4.5
GRADE-III	08	02	25
TOTAL	**48**	**03**	**6.25**

TABLE-14

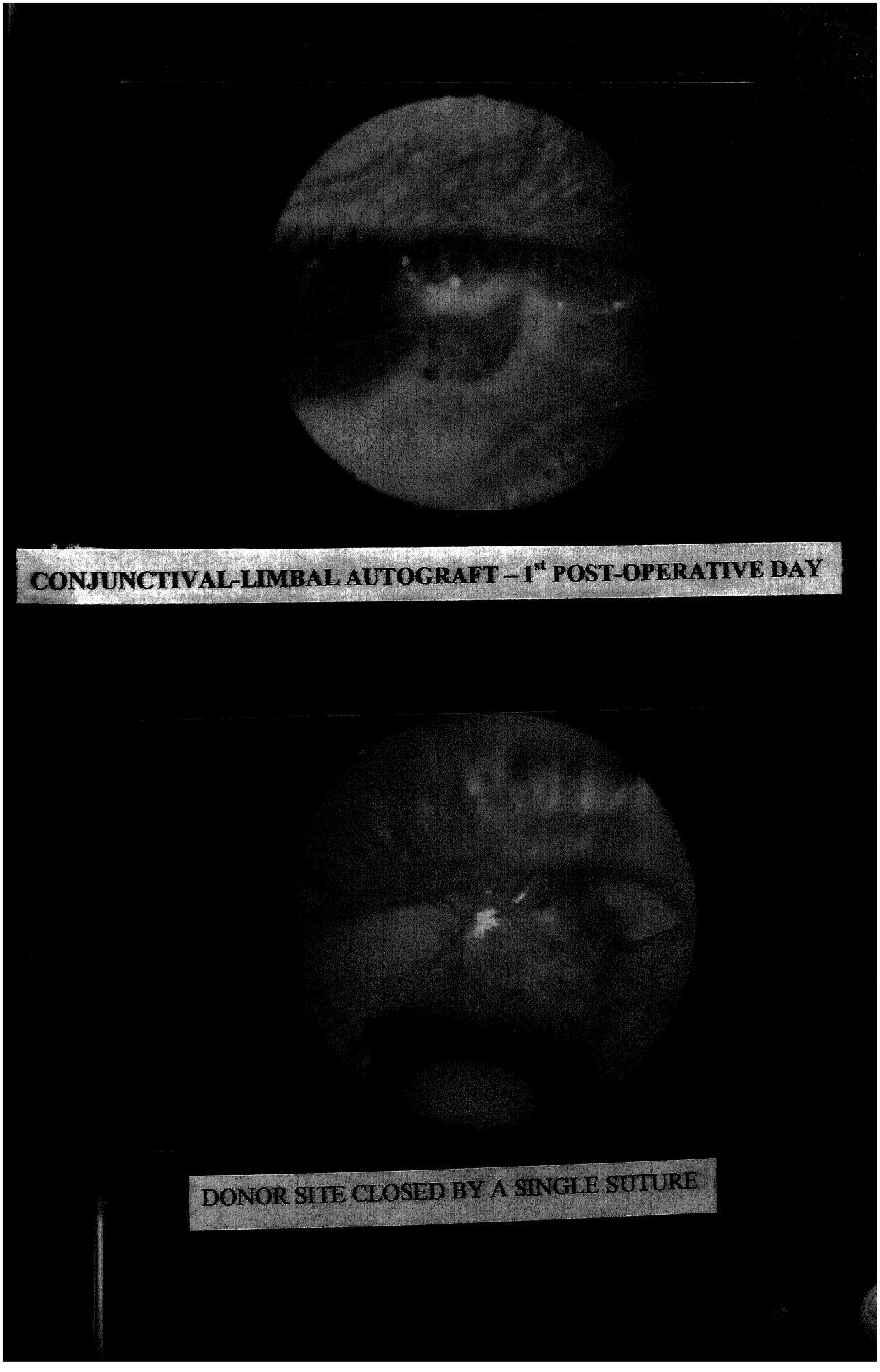
*****



CONJUNCTIVAL-LIMBAL AUTOGRAFT – 1st POST-OPERATIVE DAY

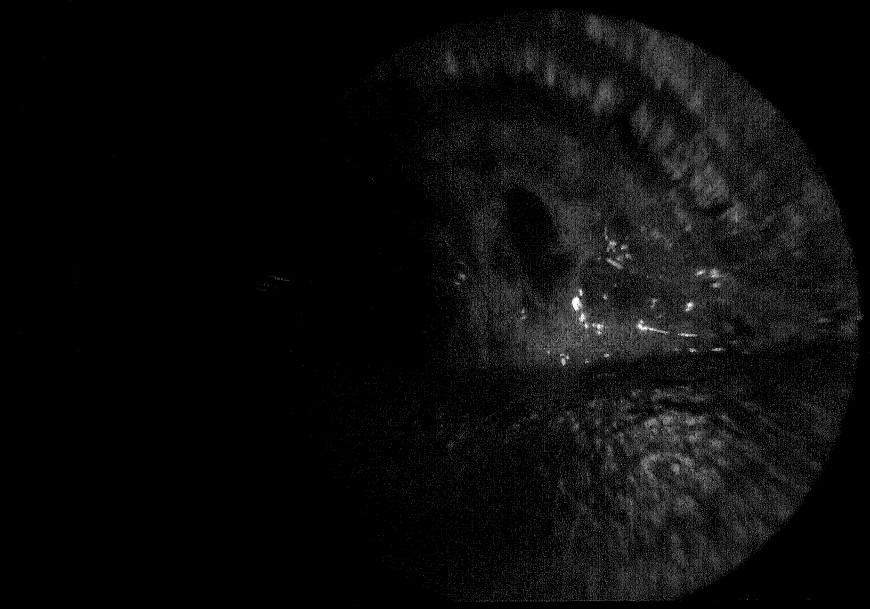


CONJUNCTIVAL-LIMBAL AUTOGRAFT – 1st POST-OPERATIVE DAY



CONJUNCTIVAL-LIMBAL AUTOGRAFT – 1st POST-OPERATIVE DAY

DONOR SITE CLOSED BY A SINGLE SUTURE



SUB-CONJUNCTIVAL HAEMORRHAGE BELOW THE GRAFT

TENON'S GRANULOMA

DISCUSSION

DISCUSSION

A pterygium is characterized by excessive fibrovascular proliferation on the exposed ocular surface and is thought to be caused by increased ultraviolet light exposure from climatic factors and aggravated by microtrauma and chronic inflammation from environmental factors.

Notwithstanding the multifactorial pathogenesis, surgery forms the mainstay of treatment. Despite the description of more than a 100 medical and surgical techniques, recurrence is the most often observed complication after treatment of pterygium. The rate of recurrence not only rises up to 80% but also, each new recurrence may cause loss of conjunctiva and extraocular muscle movement or scar formations. Complaints of the patients increase and corneal involvement accelerates.

The recurrence rate varies greatly not only among different surgical procedure but also between different groups performing the same procedure (TABLE- 15). In addition to demographic and ethnic difference, the amount of supepithelial fibrovascular tissue removed might be a major contributory factor to this variation. Barraquer, in the first introduction to conjunctival autograft to pterygia, emphasized the importance of such tissue removal and defined it as in an area greater than the pterygium itself.

Studies have indicated that a pterygium occurs as a result of localized limbal dysfunction (Dushku, Reid). The corneal epithelium undergoes a constant process of cell renewal and regeneration. Cells in its uppermost layer are continuously desquamated and lost into the tear film, and must be replaced by cell proliferation. Therefore it is endowed with a proliferative reserve in the form of multipotent stem cells located in the basal limbal epithelium. The limbal stem cells serve as a proliferative barrier between

corneal and conjunctival epithelia. Conditions that significantly damage the limbal stem cells can result in an invasion of conjunctival epithelium on to the corneal surface (conjunctivalisation). This process results in a thickened, irregular, unstable epithelium, often with secondary neovascularisation and inflammatory cell infiltration. Epithelial defects are common in the conjunctivalised corneal surface and may lead to corneal ulceration, scarring, and loss of vision. Defects in renewal and repair of ocular surface as a result of limbal stem cell deficiency are now known to cause varying ocular surface morbidity including persistent photophobia, repeated and persistent surface breakdown and overt conjunctivalisation of the cornea in conditions like pterygium. The success of conjunctival autografting techniques that include limbal tissue in the graft in treating primary and recurrent pterygia to provide for the limbal stem cell deficiency has been highlighted (Dua).

The recurrence rate for bare sclera excision has been upto 89% (Chen) while that with the adjunctive use of the mitomycin-C has be reported to be 5.9 to 42.9 %(Lam). The use of Amniotic Membrane Transplantation (AMT) has been also been studied for pterygium treatment and a study comparing AMT with conjunctival Autografting in recurrent pterygia reported a significantly higher recurrence rate after AMT (37.5%) compared to Conjunctival Autografting (9.1%)(Prabhasawat). In bare sclera techniques and its widely accepted modifications, it is supposed that the reepithelialization of the denuded cornea will be accomplished before recovering of the bare scleral area by conjunctival epithelium. Anduse and Merrit reported on patients with recurrent pterygia who underwent the standard bare sclera technique and 35% of these patients showed recurrence. Vaniscotte et al investigated 102 cases with pterygia retrospectively and

interpreted that by applying only bare sclera technique to the recurrent cases, inevitably caused secondary recurrence. Adjunctive therapies to standard surgical techniques including Thiotepa (Joselson and Muller 1966), β irradiation (Keize et al, 1987; MacKenzie et al 1991), Mitomycin C (Singh 1989) have been suggested to stop or slow the fibrovascular progression of conjunctiva over the cornea. Although successful results with recurrent cases, as low as 2-15% have been reported, there are severe sight threatening complications other than recurrence that are hardly manageable.

In 1963 Kunitomo and Mori first used Mitomycin-C to treat pterygia with a dose of 0.4 mg/ml four daily for one to two weeks. Hayasaka et al demonstrated the efficiency and safety of a lower dose (0.2 mg/ml twice daily for 5 days) with a recurrent of 6.9% after follow up to 3 to 8 years. However, several reports have described worrisome complications from Mitomycin-C therapy including scleral ulceration and calcification, corneoscleral, ciliary body, and vitreoretinal toxicity, uveitis and glaucoma. Seleromalacia has been reported with doses as low as 0.4 mg/ml once daily for 2 days. Almost all those patients had severe pain and photophobia.

Conjunctival autografting for pterygia was adopted from Thofts' use of conjunctival transplantation for chemical burns. Published recurrence rate of pterygium after excision with conjunctival autografts have ranged widely from 2% to 35%. The great variation in recurrence rate may be due to surgical techniques and experience, definition of recurrence and patient population characteristics. Age is also an important factor is recurrence after conjunctival autografting. The mean age of patients with recurrence in the study by Lewallen was 29 yrs while that in the study by Simona was 38 yrs.These studies showed high recurrence rates of 16% and 35% respectively. Complications involved in Conjunctival autografting tend to be

less severe and are rarely sight threatening. Currently the main prejudices against autografting are the expertise and time required for the procedure.

On clinical impression, greater inflammation preoperatively led to higher recurrence rate and the two appeared to be linked as supported by the age controlled analysis in this present study. No recurrence occurred after excision of Gr. I (atrophic) pterygia; the recurrence rate among patients with Gr. III (inflamed or actively growing) pterygia (2 of 8 patients, 25%) was much more than that of patients with Gr. II (Non inflamed) pterygia (1 of 22 patients, 4.5 %).

The time of recurrence has been described as within 2 to 6 months (Starck). In a retrospective study Sebban and Thrist reported the average time of recurrence after removal of primary pterygia by different technique to be 13.2 months.

Because of the large conjunctival defect remaining after excision of pterygium especially the recurrent ones, it has been proposed to cover the bare sclera with a variety of material like skin grafts, mucous or amniotic membranes. These graft materials were considered as both a mechanical barrier to prevent the progression of conjunctiva and as a biological cover to decrease inflammation, but were not applied widely because aesthetic results were not acceptable to the patients and there were considerable recurrence rates. (Vaniscotte et al 1986). In Conjunctival autografting, the bare sclera after excision of primary or recurrent pterygia is covered by the graft taken from the superior temporal bulbar conjunctiva from the same or the other eye. Since there has been no pterygium case with a location at the superior temporal quadrant, localized hypofunction of the limbal stem cells has been considered responsible for pterygium.

Elshnig proposed a similar technique in management of pterygium for the first time in 1926 (Rosenthal 1953). The reinvestigation of the conjunctival autograft technique was begun with Thofts (1977). Barraquer described conjunctival autografting in (1980), Dowlet and Laflamme (1981) reported 7.7% recurrence. The first comprehensive report on conjunctival autograft transplantation was presented by Kenyon et al (1985) with a reported recurrence of 5.3 % (3/57) in patients with recurrent and advanced pterygia. But this study emanated from Boston where the ultraviolet levels are relatively low. A similar survey from the Caribbean (Lewallen 1989) using the same techniques as Kenyon, revealed a 16% recurrence rate (3/19) indicating that a higher recurrence rate may exist in populations with ongoing exposure to high ultraviolet levels. They also stated that there was a significant association between age and sex. Youth was also found to be a risk factor for recurrence in a study in Israel (Zauberman 1976).

It has been suggested that lipoid degeneration in the cornea is an inhibiting factor to pterygium growth, based on observations that pterygia do not cross an arcus senilis to any great extent. The presence of increasing amounts of lipoid degeneration with age might explain in part the strong association found between age and recurrence. This present study also shows similar high recurrences in males and younger age group patients (Tables 3,4,13 & 14)

The success of conjunctival Limbal autografting can be explained by the following factors.

1. Conjunctival transdifferentiation might be a result of poor nutrition of the epithelial cells on the graft when compared to the conjunctival flaps in the wound healing process. Conjunctival flaps supplied by a vascular system in addition to diffusion proliferate rapidly. While the

conjunctival graft supplied only by diffusion should display metaplasia.

2. Behaviour of conjunctival graft as a biologic cover causes a decrease in inflammation and vascularization.
3. In addition to rapid regeneration of corneal epithelium by means of transient amplifying cells, the corneal epithelium integrity and the constitution of the barrier function to prevent the growth of conjunctival epithelium over cornea, have been maintained by limbal stem cells.

The various techniques of excision available for pterygia may be evaluated with reference to three principle criteria: **safety** (freedom from sight threatening complications); **visual acuity** (the effect of treatment on vision in the absence of complications); and **efficacy** (freedom from recurrence).

Complications from pterygium excision and conjunctival auto grafting in this study were infrequent and easily rectified by further minor surgery. This concurs with a previous discussion of the spectrum of complications associated with this technique by Starck et al. In contrast with adjunctive topical chemotherapy or radiotherapy, no sight threatening complications have been reported.

Pterygia may compromise vision either by direct obscuration of the visual axis or more commonly, through irregular astigmatism- induced either by distortion of the cornea or the axial tear film. Conjunctival grafts heal rapidly and would be unlikely to worsen induced astigmatism. Visual acuities were unchanged or improved in all but one of the patients reviewed here. Random variation in acuity between examinations may partly explain the observed loss of one line of unaided acuity in one case in this present

study, at 3 months after surgery, who was asymptomatic and had no signs of recurrence. Pterygium excision with any technique may induce astigmatic changes however, particularly, if care is not taken to dissect the pterygium away form the cornea in a superficial plane. Significant induced astigmatism, with a commensurate deterioration in unaided visual acuity, frequently follows pterygium excision with lamellar keratoplasty. Lamellar keratoplasty is none the less considered the treatment of choice for recurrence in the presence of a degenerate, avascular scleral bed after irradiation. A free conjunctival graft is likely to become necrotic in the situation.

Recurrence rates reported for pterygium excision with conjunctival autografting are generally low. Variations in the results from a given technique may be influenced by a number of factors including; variations with techniques, the proportion of recurrent cases operated on, differences in postoperative medication, the age and location of the population studied , the length of follow up , and the definition of recurrence employed. Although late recurrences may occur, prospective observations indicate that the majority will appear within the first 3 months. A minimum follow period of 6 months should thus avoid a signification underestimation of the recurrence rate. Topical steroid and antibiotic medications were used routinely after surgery. Starck et al commented on the importance of taking a graft of adequate size. The observation of cases in which a pterygium appeared to have recurred around the edge of the graft (out flanking) suggests that larger grafts help to protect form recurrence. Conjunctival grafts of up to 15 x 15 mm can be taken with impunity. We observed no significant scarring or loss of conjunctival motility at the donor sits where the conjunctiva is simply closed by a single suture.

PUBLISHED RATES OF PTERYGIUM RECURRENCE AFTER EXCISION AND CONJUNCTIVAL AUTOGRAFTING

Authors	Location	No. of cases	Recurrence
Dowlut (1981)	Canada	15	8%
Kenyon (1985)	Boston	57	5%
Lewallen (1989)	St Kitts	19	16%
Singh (1990)	Los Angeles	13	8%
Mrzyglod (1990)	Poland	41	3%
Koch (1990)	Essen	13	8%
Simona (1990)	Geneva	14	35%
Allan (1993)	Perth	93	6.5%
Tan (1997)	Singapore	78	1.2%
Rao (1998)	Chennai	53	3.8%

TABLE-15

*****

SUMMARY & CONCLUSIONS

SUMMARY AND CONCLUSION

This work is an experimental study where conjunctival limbal autograft transplantation was performed in cases with primary and recurrent pterygia to observe their effectiveness in preventing recurrence, to elucidate any intra or postoperative complications encountered and to evaluate the effect of the surgery on visual acuity.

A total 48 eyes of 48 patients underwent surgery over a period of 12 months. 83.3% of the cases had primary pterygia. There was a male preponderance in the cases (62.5%).

Recurrence occurred in 3 eyes (6.3%) within 6 months after surgery. Recurrence rate in primary cases was 5% (2 in 40 cases) while that in recurrent cases was 12.5% (1 in 8 cases). Greater inflammation preoperatively, as seen according to morphological grading of pterygium, led to higher recurrence rates and the two factors appeared to be linked. Also, younger age and male gender was associated with a higher propensity of recurrence.

Although it is not uncommon to encounter minor problems such as conjunctival graft edema, corneoscleral dellen, epithelial cysts, the overall success of the procedure, lack of significant complications and independence from adjunctive pharmacologic or radiation therapies is especially encouraging. Careful dissection of Tenon's tissue from the conjunctival graft and recipient bed, minimal manipulation of tissues and accurate orientation of the graft are the key factors for an optimal surgical result.

Visual acuity was unchanged in 77% and improved in 21% of the cases. Pterygia may compromise vision either by direct obscuration of the visual axis or more commonly, through irregular astigmatism- induced either by distortion of the cornea or the axial tear film. Conjunctival grafts heal rapidly and are unlikely to worsen induced astigmatism.

In conclusion, this study demonstrates a low recurrence rate from pterygium excision and conjunctival autografting in a predominantly rural, middle aged Indian population in an area in which pterygia are prevalent and ultraviolet radiation levels are high. This technique is free from sight threatening complications, unlike topical chemotherapy or radiotherapy and has no manifest deleterious effect on visual acuity. No major operative or postoperative complications were encountered. The inclusion of limbal tissue in conjunctival autografts following pterygium excision appears to be essential to ensure low recurrence rates. This technique is safe, simple and inexpensive and is recommended for the management of both primary and recurrent pterygia in Indian eyes.

From the study we arrived at the following conclusions:

- Recurrence occurred only in 6.3% of cases, similar to the low rates reported in other studies.
- There is a male preponderance in the incidence of pterygium in this region resulting from greater exposure to ultraviolet light due to greater outdoor activity.
- Young age and male gender was associated with greater recurrence after pterygium surgery.
- Greater inflammation preoperatively led to higher recurrence rates.

- Complications that occurred were minor and either required no treatment or were managed by simple interventions.
- Visual acuity in most cases was unchanged or improved after surgery.

*****

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Alfred L. Anduze, Jettie M. Burnett. Indications for and Complications of Mitomycin-C in Pterygium Surgery ***Ophthalmic Surg Lasers*** **1996;27:667–673**

2. Allan BDS, Short P, Crawford GJ, Pterygium excision with conjunctival autografting: an effective and safe technique- ***Br J Ophthalmol 1993; 77:698-701.***
3. Alp BN, Yanyali A, Ay GM, Keskin O. Conjunctival rotation autograft for primary pterygium ***Ophthalmologica 2002 Sep-Oct;216(5):333-6***

4. Chan PP, Ariyasu RG, Kaza V, McDonnell PJ. Randomized trial comparing Mitomycin-C & Conjunctival autograft after excision of primary Pterygium. ***Am JOphthalmol 1995; 120:151-60.***
5. Coroneo MT. Pterygium as an early indicator of ultraviolet insolation: a hypothesis. ***Br J Ophthalmol 1993;77:734-739.***
6. Dadeya S, Kamlesh, Khurana C, Fatima S. Intraoperative daunorubicin versus conjunctival autograft in primary pterygium surgery. ***Cornea 2002 Nov;21(8):766-9***
7. de Keizer RJ. Pterygium excision with free conjunctival autograft (FCG) versus postoperative strontium 90 (90Sr) beta-irradiation. A prospective study. ***Int Ophthalmol 1997-98;21(6):335-41***
8. de Ocampo G, Fojas MR, dela Cruz-Estrella. The Nature of Pterygium: A Clinicopathologic Study. ***Phil J Surg and Surg Spec1960;15:174-9.***

9. Dekaris I, Gabric N, Karaman Z, Mravicic I, Kastelan S, Spoljaric N. Pterygium treatment with limbal-conjunctival autograft transplantation. ***Coll Antropol 2001;25 Suppl:7-12***

10. Dekaris I, Gabric N, Karaman Z, Mravicic I, Kastelan S. Limbal-conjunctival autograft transplantation for recurrent pterygium. ***Eur J Ophthalmol 2002 May-Jun;12(3):177-82***

11. Dowlut MS, Laflamme MY. Recurrent pterygia: frequency and treatment by conjunctival autograft Can ***J Ophthalmol 1981 Jul; 16(3):119-20***

12. Du Z, Jiang D, Nie A. Limbal epithelial autograft transplantation in treatment of pterygium ***Chung Hua Yen Ko Tsa Chih 2002 Jun;38(***6):351-4

13. Dua H S, Saini J S, Azuara-blanco A, Gupta P Limbal Stem Cell Deficiency: Concept, aetiology, Clinical Presentation, Diagnosis and Management. ***Indian J Ophthalmol 2000;48:83-92***

14. Dushku N, Reid TW. Immunohistochemical evidence that human Pterygiaoriginate from an invasion of vimentin-expressing altered limbal epithelial basal cells. ***Curr Eye Res 1994; 13:473-81.***

15. Dushku N, Reid TW. Immunohistochemical evidence that human pterygia originate from an invasion of vimentin-expressing altered limbal epithelial basal cells. ***Curr EyeRes 1994;13:473-81. Eye1997;11:790-2***

16. Figueiredo RS, Cohen EJ, Gomes JAP, Rapuano CJ. Conjunctival autograft for Pterygium surgery: how well does it prevent recurrence? ***Ophthalmic Surg Lasers 1997; 28:99-104.***

17. Gris O, Guell JL, del Campo Z. Limbal-conjunctival autograft transplantation for the treatment of recurrent pterygium. ***Ophthalmology 2000 Feb;107(2):270-3***

18. Guler M, Sobaci G, Ilker S, Ozturk F, Mutlu FM, Yildirim E. Limbal-conjunctival autograft transplantation in cases with recurrent pterygium. ***Acta Ophthalmol (Copenh) 1994 Dec;72(6):721-6***

19. Guler M, Sobasci G, Liker S, Yildirum E, Conjunctival autograft transplantation in cases with recurrent Pterygium. ***Acta Ophtholmol 1994; 72:721-26.***

20. Hara T, Shoji E, Ohara Y. Pterygium surgery using the principle of contact inhibition and a limbal transplanted pedicle conjunctival strip. ***Ophthalmic Surg 1994; 25:95-8***

21. Hayasaka S, Noda S, Yamamoto Y, et al. Postoperativeinstillation of low-dose mitomycin C in the treatment of primary pterygium. ***Am J Ophthatmol 1988:106:715-8.***

22. Hayasaka S, Noda S, Yamamoto Y, Setogawa T. Post operative instillation of low dose Mitomycin-C in the treatment of primary Pterygium. ***Am J Ophthalmol1989; 107:571***

23. Hille K, Hoh H, Gross A, Ruprecht KW. Prospective study of surgical therapy of pterygium: bare sclera technique vs. free conjunctiva-limbus transplant. ***Ophthalmologe 1996 Jun;93(3):224-6***

24. Hirst CW, Sebban A, Chant D. Pterygium recurrence time. ***Ophthalmology 1994;101:755-58.***

25. Jaros PA, DeLuise VP. Pingueculae and pterygia. ***Surv Ophthalmol 1988;33:41-9***

26. Karai I, Horiguchi S. Pterygium in welders. ***Br J Ophthalmol1984;68:347-349.***

27.Kenyon KR, Wagoner MD, Hettinger ME. Conjunctival autograft transplantation for advanced and recurrent Pteryigium. ***Ophthalmology 1985; 92:1461-70.***

28.Kenyon KR, Wagoner MD, Hettinger ME. Conjunctival autograft transplantation for advanced and recurrent pterygium ***Ophthalmology 1985; 92: 1461-70.***

29. Kmiha N, Kamoun B, Trigui A, Jelliti B, Fourati M, Chaabouni M. Effectiveness of conjunctival autograft transplantation in pterygium surgery ***J Fr Ophtalmol 2001 Sep;24(7):729-32***

30.Koch JM, Mellin JB, Wauble TN. The Pterygium-autologous conjunctival-limbus transplantation as treatment. ***Ophthalmology 1992; 89:143-46.***

31. Kwok LS, Coronea MT. A model for pterygium formation.***Cornea 1994;13;219-24.***

32.Lewallen SA, Randomized trial of Conjunctival autografting for Pterygium in tropics. ***Ophthalmology 1989; 96:1612-14.***

33.Mackenzie FD, Hirst LW, Kynaston B, Barn C. Recurrence rate and complication after beta-irradiation for Pterygia. ***Ophthalmology 1991; 98: 1776-81.***

34.Mackenzie FD, Hirst LW, Kynaston B. et al. Recurrence rate and complications after beta irradiation for pterygia.***Ophthalmology 1991:98:177681***

35.Mahar PS Conjunctival autograft versus topical mitomycin-C in treatment of pterygium complications of topical mitomycin-C after pterygium surgery Ophthalmology ***1992;99:1647-54.***

36. McCoombes JA, Hirst LW, Isbell GP. Sliding conjunctival flap in the treatment of primary pterygium. ***Ophthalmology 1994; 101:169-73***

37. Mohamed Abd EL-Fatah Shaheen, MD Trephine Assisted Excision of the Pterygium with Intraoperative Mitomycin C ***Bull egyptian ophthalmol soc, 2000; 93, number 1***

38. Monselise M, SchwartM, Polili F, et al. Pterygium and beta irradiation. ***Acta Ophthalmol 1984;62:315-9.***

39. Moran DJ, Hollows FC. Pterygium and ultraviolet radiation: a positive correlation. ***Br J Ophthalmol 1984;68:343-346.***

40. Mutlu FM, Sobaci G, Tatar T, Yildirim E. A comparative study of recurrent pterygium surgery: limbal conjunctival autograft transplantation versus mitomycin C with conjunctival flap. ***Ophthalmology 1999 Apr;106(4):817-21***

41. Prabhasawat P, Barton K, Burkett G, Tseng SC. Comparison of conjunctival autografts, amniotic membrane grafts, and primary closure for pterygium excision. ***Ophthalmology 1997 Jun;104(6):974-85***

42. Pulte P, Heiligenhaus A, Koch J, Steuhl KP, Waubke T. Long-term results of autologous conjunctiva-limbus transplantation in pterygium ***Klin Monatsbl Augenheilkd 1998 Jul;213(1):9-14***

43. Rao SK. Lekha T, Mukesh HN, Sitalakshmi G, Padmanabhan P. Conjunctival-limbal autografts for primary and recurrent pterygia; technique and results. ***Indian J Ophthalmol 1998 Dec;46(4):203-9***

44. Riordan-Eva P, Kielhorn I, Ficker LA, Conjunctival autografting in the management of Pterygium. ***Eye 1993; 7:634-38.***

45. Rubinfeld RS, Pfister RR, Stein RM, Foster CS, Martin NF, Stoleru S, et al. Serious complications of topical mitomycin-C after pterygium surgery ***Ophthalmology 1992;99:1647-54***

46. S Dekaris I, Gabric N, Karaman Z, Mravicic I, Kastelan. Limbal-conjunctival autograft transplantation for recurrent pterygium. ***Eur J Ophthalmol 2002 May-Jun;12(3):177-82***

47. Said A. Fouad ARA, Mostafa MSE. Abbas S. Surgical management of recurrent pterygium by an operation of transposition. ***Bull Ophth Soc Egypt I975; 68:81-4.***

48. Sanchez-Thorin JC, Rocha G, Yelin JB Meta-analysis on the recurrence rates after bare sclera resection with and without mitomycin C use and conjunctival autograft placement in surgery for primary pterygium ***Br J Ophthalmol 1998 Jun;82(6):661-5***

49. Sangduck Kim, Yunsik Yang, Jaeduck Kim Primary Pterygium Surgery Using the Inferior Conjunctival Transposition Flap ***Ophthalmic Surg Lasers*** **1998;29:608–611**

50. Sebban A, Hirst LW. Pterygium recurrence rate at the Princess Alexandra Hospital- ***Aust N Z J Ophthalmol 1991;19:203-6***

51. Shimazaki J, Kosaka K, Shimmura S, Tsubota K. Amniotic membrane transplantation with conjunctival autograft for recurrent pterygium. ***Ophthalmology 2003 Jan;110(1):119-24***

52. Shimazaki J, Yang HY, Tsubota K. Limbal autograft transplantation for recurrent and advanced pterygia. ***Ophthalmic Surg Lasers 1996 Nov;27(11):917-23***

53. Singh G, Wilson MR, Foster CS. Mitomycin eye drops as treatment for pterygium. ***Ophthalmology 1988;95:813-21.***

54. Singh G. Wilson MR, Foster CS. Long-term follow-up study of mitomycin eye drops us adjunctive treatment for pterygia and its comparison with conjunctival autograft transplantation. ***Cornea 1990;9:331-4.***

55. Singh G. Wilson MR. Foster CS. Mitomycin eye drops as treatment for pterygium. ***Ophthalmology 1988;95:813-21.***

56. Starc S, Knorr M, Steuhl KP, Rohrbach JM, Thiel HJ. Autologous conjunctiva-limbus transplantation in treatment of primary and recurrent pterygium ***Ophthalmologe 1996 Jun;93(3):219-23***

57. Starck T, Kenyon KR, Serrano F. Conjunctival autografts for primary and recurrent pterygia: surgical technique and problem management. ***Cornea 1991,10:196-202.***

58. Sy GT, Malabag A, Mangubat L. Subconjunctival 5-Fluoro-uracil (5-FU) In The Prevention Of Pterygium Recurrence. ***Phil J Ophthalmol.***

59. Tan DH, Chee SP, Dear KBG, and Lim ASM. Effect of Pterygium Morphology on Pterygium Recurrence in a Controlled Trial Comparing Conjunctival Autografting with Bare Sclera Excision. ***Arch Ophthalmol 1997;115:1235-1240.***

60. Tan DT, Chee SP, Dear KB, Lim AS. Effect of pterygium morphology on pterygium recurrence in a controlled trial comparing conjunctival autografting with bare sclera excision. ***Arch Ophthalmol 1997;115:1235-40***

61. Taylor HR, West SK, Munoz B, et al. The Long-term Effects of Visible Light on the Eye- ***Arch Ophthalmol 1992;110:99-104.***

62. Taylor HR, West SK, Rosenthal FS, et al. Corneal Changes Associated With Chronic UV Irradiation. ***Arch Ophthalmol 1989;107:1481-1484.***

63. Ti SE, Chee SP, Dear KB, Tan DT. Analysis of variation in success rates in conjunctival autografting for primary and recurrent pterygium. ***Br J Ophthalmol 2000 Apr;84(4):385-9***

64. Tseng SCG, Chen JJY, Huang AJW, Kruse FE, Maskin SL,Tsai RJF. Classification of conjunctival surgeries for corneal diseases based on stem cell concept. ***Ophthalmol Clin North Am 1990; 3:595-610.***

65. Vaniscotte MH, Lancombe E, Pouliquen Y. 102 cases of pterygium: surgical treatment study results. ***J Fr Ophthalmol1986:9:227-30.***

*****